AN ANALYSIS OF THE RECORDS MANAGEMENT PROCESS TO DETERMINE THE IMPACT OF AUTOMATION ON PRODUCTIVITY

THESIS

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The views expressed in this thesis are those of the authors and do not reflect the official policy or position of the Department of Defense or the U. S. Government.

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Preface

This research provided us the opportunity to take a look at a new approach to records management that promises to make it more efficient and less burdensome. As former project engineers and future program managers, our knowledge of the records management system prior to this research was narrow and, of course, biased. Consequently, completion of this thesis project required the help and understanding of many people.

First of all, we would like to give special thanks to Ms. Patty Potts. In her *fragile* condition she always smiled and replied, "sure" when we asked her to repeat the same dull, records management tasks so we could gather our data.

Next, we would like to thank Ms. Wanda Dunning, SMSgt. Chuck Weaver, and SMSgt. Pat Shediack for their patience in working with us throughout the summer to help us define the records management process.

We would also like to thank our faculty advisors for their patience. At times it seemed like there was no love lost between us, but you kept our noses to the grindstone and helped us complete our thesis successfully and on time.

Most of all though, we need to thank our families for their love and understanding. At times, it seemed as if we were married to our computers as we struggled through many late nights working to meet deadlines. Thanks for your support and understanding.

Dave Gaines
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Abstract

This research was performed to study the effects of automation on Air Force records management productivity prior to widespread implementation of Document Librarian. Document Librarian is a software tool developed for Headquarters Air Force Materiel Command (HQ AFMC) to manage records in accordance with Air Force, Federal, and National Archives and Records Administration (NARA) regulations, and is currently undergoing developmental testing. As a result, only one organization, HQ AFMC, Office of Corporate Information (HQ AFMC/CIMR), currently uses Document Librarian for records management. This organization was used in a case study to determine the effects of Document Librarian on the organization's records management productivity. A records management process model was constructed and used to define the relevant tasks and outputs of their records management process. Administrative Productivity Indicators (APIs), a productivity measuring technique, was then used to determine a measure of productivity for the tasks defined by the model. In addition, the Records Technician was interviewed to determine the amount of labor hours per week spent managing records. This data, along with the measure of productivity, were used to determine the overall productivity differences.

The results showed approximately a 30% to 31% increase in the Records Technician's productivity when records were managed with Document Librarian. For this organization, the Records Technician reported spending approximately two hours or less per week on records management tasks; therefore, Document Librarian resulted in saving approximately 31 to 50 minutes per week.

AN ANALYSIS OF THE RECORDS MANAGEMENT PROCESS TO DETERMINE THE IMPACT OF AUTOMATION ON PRODUCTIVITY

I. Introduction

With the shift in the national defense strategy brought on by the end of the cold war in Europe, the Air Force is facing major reductions in human resources. Reductions in federal spending are also the order of the day, and all sections of government, including defense, must reduce spending. In this environment, the Air Force is constantly seeking ways to improve productivity. Improved productivity can lead to work being done more efficiently, allowing many Air Force missions to be accomplished with fewer people and at lower cost. Computers are one of the tools most often looked at to achieve this goal.

In the past decade, spending on computers in the Department of Defense (DoD) has been on the rise (13:36). Many feel that computers are important office automation tools which, if used correctly, can improve an organization's productivity (16:14 - 42, 4:41 - 52). Given the need to accomplish its mission with fewer human and fiscal resources, and given the potential for computers to improve an organization's productivity, new and innovative applications of computers should be explored to overcome the effects of today's changing environment on the Air Force.

This study, then, looks at a new computer software product, called Document Librarian, to determine its potential for improving the productivity of office workers in performing certain records management

tasks. Document Librarian, developed for the Air Force by Wang Laboratories, is a tool for automating the records management process within a given office.

Background

This section describes information and records management as it currently exists in the Air Force, and introduces Document Librarian as a tool to automate the records management process. For successful Air Force operations, information is a valuable, and often strategic, resource (5:3). Aircraft Wing Commanders require constant, up-to-date information to keep track of the location and status of aircraft under their command, and to assess the availability of air crews for duty. Program Managers also require constant and current information to assess contractor performance on weapon system projects.

Information Management. Because information can be vital to mission success, managing information as a resource is as important as managing any other vital resource. Secretary of the Air Force Order (SAFO) 560.1, *The Air Force Information Resources Management Program*, was instituted in September 1988, establishing information management as an activity in all Air Force major commands. Information management activities support the mission of Air Force organizations by providing systems, services, training and resources, and by emphasizing combat readiness of the information resources (5:1). According to Air Force Regulation (AFR) 4-1, *Functions and Responsibilities of Information Management Activities*, the functions and responsibilities of information management include information collection, paperwork reduction, statistical activities, records, forms and publications

management, privacy and security of records, data standards, and sharing and dissemination of information.

Records Management. Records are an important part of the Air Force, and records management is an important information management function. According to AFR 4-30, "every official action in the Air Force results in creating some type of record"(6:1). Federal and Air Force Regulations require organizations to maintain many different types of records. For example, a System Program Office (SPO) responsible for developing a weapon system can have volumes of records, including personnel training folders, official office correspondence, policy letters, awards, messages, reports, forms, publications, plans, budgets, orders, and contractual correspondence and documents. These records can exist in many different media, such as paper, electronic, microfilm, video, or film, and usually have different life cycles ranging from as little as three months to decades.

Air Force information management policy prescribes implementing records management as a required function of Air Force activities (5:1). This includes:

> 1. Developing policies and procedures and providing guidance and assistance in proper maintenance and disposition of all records including creating, processing, transferring, disseminating, using, storing, retrieving, preserving, and disposing of records in any media. (5:9)
>
> 2. Establishing criteria for disposal or preservation of non-current records based on their administrative, legal, research, historical, or other value. (5:9)
>
> 3. Procuring records disposal authorization from federal agencies including the National Archives and Records Administration (NARA), General Services Administration (GSA), General Accounting Office (GAO), when appropriate, including necessary concurrence of other Federal agencies. (5:9)

4. Establishing policies, procedures, and standards to ensure effective use of equipment, manpower, and space devoted to managing records. (5:9)

5. Operating productive and cost-effective office information systems for the life cycle of records. (5:9)

Manual Records Management. Today, many documents kept as records are created electronically or can be delivered to an organization electronically. However, much of this electronically created or delivered documentation must be converted to paper documentation for handling in the current, manual records management environment. Filing, retrieving, and disposing of records are all examples of manual tasks requiring the conversion of electronic documents to paper documents.

In the manual records management environment, documents are file coded, filed, and maintained all by hand. Manual records management requires personnel to determine the file code and retention rule for the document, hand write the code on the document, then place the document in the file folder associated with the file code. Under this system, managers typically do not know where documents are filed and must rely on administrative personnel to locate records. As documents accumulate over time, retrieval can be difficult even for administrative personnel, and mis-files can occur. Periodically, personnel are required to purge these files and dispose of records in accordance with the records' retention requirements. Depending on the number of records maintained by an organization, this can be a very time consuming task.

Automated Records Management. Although records management is a major Air Force activity, and computer usage and application to office automation are on the upswing, the automation of records management has

been slow. In developing office automation requirements for Headquarters Air Force Material Command (HQ AFMC), the Office of Corporate Information (HQ AFMC/CIMR) recognized the lack of office automation capabilities for managing Air Force records. To satisfy the HQ AFMC requirement for automated records management, HQ AFMC/CIMR implemented a program to develop a software tool, called Document Librarian, to electronically manage retrieval, retention, access control, and disposition of records in accordance with federal law, NARA requirements, and Air Force regulations (18). Document Librarian operates in an electronic environment and processes documents from creation (by approved application software such as Microsoft® Word for Windows™ or Excel™) until they are destroyed or transferred to a federal records center or the National Archives (18).

In the electronic records management environment, Document Librarian uses electronic file cabinets (disk storage facilities) and folders for filing and retrieving documents. Electronic cabinets can be personal cabinets, shared group cabinets, or organizational level cabinets. Document Librarian also protects documents by providing various levels of security to grant, limit, or deny access to file cabinets. In addition, with Document Librarian, the exact location of a document need not be known. Key word searches can be used to locate all existing documents containing a selected word or phrase. Purging of documents can also be done automatically by Document Librarian.

General Issue

As pointed out previously, automating the records management process has been slow, and HQ AFMC/CIMR, is currently developing and implementing a personal computer based software program, called Document Librarian, to allow for electronic records management.

As will be discussed in chapter II, attempts to apply information technology and computers to automate business processes and improve productivity have often not achieved the expected successes. Many organizations have invested large amounts of capital in computers and information technology to improve employee productivity but, in many cases, this investment has had little impact on productivity (15:15). For example, James Ayers, in an article appearing in *Information Strategy: The Executive's Journal*, cites a health maintenance organization whose information services department developed and implemented a new system to make patient appointments with physicians (1:26). The intent of the system was to reduce patient no shows, thereby increasing physician productivity. The new system required the operator to record several additional items of information about each caller, doubling the time required to set an appointment. The result was a backlog of angry patients waiting on the phone to make appointments, which did nothing to improve physician productivity (the original intent of the system), and actually decreased customer satisfaction (1:26).

The above example shows that applying information technology to a business process does not always result in improved productivity. Wang Federal Systems Division cites improved productivity as one of Document Librarian's benefits (18). This example leads to an interesting question: Can

research determine the effects of Document Librarian on an organization's records management productivity prior to its widespread implementation?

Problem Statement

This research will attempt to determine whether or not Document Librarian improves an organization's records management productivity. Because automating business processes has met with only limited success in the past, it would be beneficial to the Air Force if research can establish the effects of Document Librarian on an organization's records management productivity prior to its widespread implementation. Results of this research can be used by Air Force managers in deciding whether or not to implement Document Librarian as a records management productivity improvement tool for their organization.

Research Objective

The objective of this research is to estimate the difference in records management productivity between managing records using the current manual process and managing records using Document Librarian as an office automation tool for electronic records management. The specific objectives are as follows:

1. Define the records management process, and determine which of the current manual tasks are implemented electronically with Document Librarian.

2. Determine a suitable technique for measuring the productivity of the selected records management tasks, and use this technique to determine

the productivity of these tasks when performed manually and electronically with Document Librarian.

3. Determine the more productive of the two processes.

Research Questions

To accomplish the research objectives, the following questions must be addressed:

1. What are the tasks and outputs of the current manual records management process?

2. Which tasks from the current records management process are implemented electronically by Document Librarian?

3. What is the baseline measure of productivity for the current process using the records management tasks selected in question two above?

4. What is the equivalent measure of productivity when Document Librarian is used to automate the tasks selected in question two above?

5. What are the productivity differences between comparable tasks of the two processes?

6. For the tasks selected, what percentage of the overall labor hours spent on records management tasks are spent performing these selected tasks?

Scope of Research

In the Air Force, records management is an important process. As stated earlier, every official action in the Air Force results in some type of record being created, and organizations are required by law and regulations to maintain official records. The process by which Air Force records are managed can be divided into two phases. In the first phase, organizations

create records, maintain the records, and, based on retention and disposition rules, dispose of the records. The disposed records are either destroyed or transferred to a federal records center or the National Archives. The second phase involves maintaining records at the federal records centers and at the National Archives. Here, records are again maintained, and again, based on retention rules, disposed.

This research will focus on the first phase -- managing records within an organization. Consequently, the scope of this research will only consider managing records in an Air Force organization, not at a federal records center or at the National Archives.

In addition, Document Librarian is currently being used as an office automation tool by only one organization, HQ AFMC/CIMR. As a result, this research is limited to investigating the effects of Document Librarian on only that organization's records management process. Although the study is limited to one organization, the results are applicable to many Air Force organizations because Air Force and Federal regulations dictate how records management must be accomplished in all organizations.

II. Literature Review

Because productivity and productivity improvements gained by the use of computers and information technology are important elements of this research, this chapter provides background on productivity and the effects of computers and information technology on productivity improvement.

Key Definitions

Blue collar workers and white collar workers are the two main classes of workers making up today's work force. In addition, the white collar work force is further divided into two main subclasses: knowledge workers and service workers. Because white collar productivity and the measurement of white collar productivity constitute a large portion of this chapter, the following key definitions are provided to define the types of occupations that make up the blue collar work force and the white collar work force and its subclasses.

> Blue Collar Worker: People directly engaged in transforming materials, also generally physical work (14:287).
>
> White Collar Worker: Professional and technical workers such as medical professionals, lawyers, teachers, engineers, supervisors, managers, public administrators, clerks, sales professionals, computer programmers, and the self-employed (14:267).
>
> Knowledge Worker: White collar professional workers such as doctors, lawyers, engineers, and managers (15:9).
>
> Service Worker: Class of white collar workers such as retail sales staff, cashiers, waiters, bartenders, hotel staff, fire-fighters, police, security personnel, hair dressers, domestic workers, cleaners, and medical staff (14:267).

Introduction

In macroeconomics, productivity is an important economic parameter. It is an indication of prosperity in an economy, with periods of increasing productivity usually marked by sustained prosperity (15:2). At the organizational level, productivity is also an important parameter. In organizations operating for profit, increased productivity can lead to increased profitability and market share, and for non-profit and governmental organizations, increased productivity can lead to efficient use of financial resources (reduced operating budgets).

Because productivity is an important parameter, many organizations have information management functions in place that constantly measure and evaluate the organization's productivity. In August 1983, the American Productivity Center showed an increase in the number of corporations using productivity measures as key elements of corporate reporting (3:4.114). By tracking productivity ratios over time, an organization can evaluate its performance and maintain its competitiveness.

The Department of Defense (DoD) is also placing increased emphasis on productivity. In August 1992, the DoD, under the Office of the Assistant Secretary of Defense for Information Management, instituted DoD manual 8020.1-M (Draft), *Functional Process Improvement*. The purpose of this program is to improve productivity in the military by implementing a continuous process improvement program within all functions and components of the DoD (7:8).

To understand productivity and the role of information technology in productivity improvement, this chapter discusses productivity in general, and white collar productivity in particular. Then it discusses why measuring

productivity is important to organizations. The discussions on productivity include various ways of measuring it, along with their inherent difficulties. Also discussed in this chapter are productivity improvement programs in the Air Force. Since implementation of Document Librarian into the records management process can be considered as a process improvement program, this chapter also discusses applying information technology to improve white collar productivity and the historical lack of success in increasing white collar productivity.

Productivity

Productivity is a measure of efficiency and is usually defined by an output/input ratio, with the output being the goods or services produced by an organization over a given period of time, and the input being the resources used to produce the output.

As a measure of efficiency, there is no ideal productivity level (2:14). Productivity has meaning only in relative terms, and is usually used in a competing context based on a "more" or "less" comparison, with more productive being favored over less productive. For example, a process is said to be more or less productive than another comparable process, a firm is said to be more or less productive this period than the last, or one worker is said to be more or less productive than another.

Productivity measures can be used as performance indicators at almost any organizational level. On the societal level, Gross National Product per capita or Gross Domestic Product per employee are productivity measures. These measures are used as indicators of prosperity and standard of living. They are also used for international comparison, although this can be

difficult because of the differences of measures among countries, the differences in mix of industries, and the differences in wage scales (2:16).

When implemented at the industry or firm level, productivity measures can be used as a performance measure to define or measure many aspects of the organization. Output per worker, return on investment, labor cost per unit produced, net earnings per share, and actual versus planned output are all examples of productivity measures used by organizations.

White Collar Productivity

In recent years, the percentage of the white collar work force in relation to the blue collar work force has risen. Alan Lawlor, from estimates prepared by the Israel Institute of Productivity, said that nearly 70% of the U.S. work force in 1982 were white collar workers (14:264 - 266). Chester L. Brisley, citing a study conducted by the American Productivity Center, estimated the white collar work force as being 53% of the total labor force in 1983 (11:22), while Roach, in 1987, put the proportional estimate of the number of white collar workers to the number of blue collar workers at almost 60% (15:4). Although these figures vary, they clearly show the white collar work force commanding a larger percentage of the total work force, and some experts believe that this figure can rise to as high as 90% by the turn of the century (11:22).

Along with the shift in recent years of the work force from blue collar workers to white collar workers, there has been a corresponding decline in white collar productivity (12:S/R 5). Because productivity is a measure of profitability and prosperity, and because the white collar work force commands a large and growing percentage of the work force, improving white

collar productivity is becoming a growing concern of managers and economists.

Measuring Productivity

Organizations use productivity measures for many reasons. One such use would be projecting input requirements to achieve desired output targets. For example, by knowing its productivity, a firm can use forecasted production (output) and productivity to forecast future employment (input) requirements. Productivity can also be used as a policy variable. For instance, if an organization knows how much output it must produce and has limited resources, it can derive its required productivity and use it as a performance goal.

Still another use for productivity measures is to analyze a capital investment proposal. By knowing the current productivity, and estimating the productivity resulting from the capital investment proposal, "cost to implement" versus "productivity improvement" can be used as a decision tool in deciding whether or not to approve the capital investment proposal. This concept is similar to the scope of this research.

Other needs for productivity measures include monitoring post-investment performance, comparing operating performance of similar facilities, and comparing the productivity of one period with that of another (productivity indexing).

Techniques for Measuring Productivity. Because there are many reasons and situations for measuring productivity, various techniques have been devised to measure it. Most of these techniques conform to the traditional output/input ratio concept. However, in some instances, where

outputs are not well defined or are intangible, non traditional techniques such as survey questionnaires are sometimes used to measure productivity.

Traditional Measuring Techniques. Most traditional productivity measures were designed to measure manufacturing productivity. In measuring traditional productivity (output vs input), there are six conceptual measures divided into two major categories (11:8 - 16). The first category, static productivity ratios, refers to measures of output for a certain period of time divided by measures of input taken over the same period of time. Static productivity measures only indicate productivity for a specific period, show no comparison with other periods, and do not show productivity trends. The second category, dynamic productivity indexes, shows a percentage difference between the static ratios of two periods and is expressed as the ratio of the current period to the preceding period. Dynamic productivity indexes show comparison between periods and productivity trends.

Within each category, there are three types of productivity measures, partial factor productivity, total factor productivity, and multi-factor productivity.

1. Partial Factor Productivity Measure: A partial factor productivity ratio relates one or more of the outputs of an organization to the quantity of a single input. Typically, output is divided by labor, capital, materials, or energy to calculate partial factor productivity measures. Using partial factor productivity measures can present problems because it uses only one input (3:3.49). Relating output to only one input does not account for other factors that may affect productivity. This, as a result, can lead to misinterpretation of productivity figures because a manager may attribute low productivity to labor when, in fact, the problem may be caused by other factors.

Consequently, partial factor productivity often does not completely explain differences in productivity, nor does it measure the efficiency with which an organization uses all of its resources (3:3.49). To overcome this difficulty, many organizations measure and monitor partial productivity factors for each input resource.

2. Total Factor Productivity Measure: A total factor productivity ratio includes all the outputs and all the inputs of an organization--the efficiency of the total process. The primary difficulty with this measure is quantifying all the inputs and all the outputs (3:3.49).

3. Multi-Factor Productivity: A multi-factor productivity ratio includes some or all of the outputs and some of the inputs of an organization. The difficulties associated with this measure are similar to those associated with total factor productivity; because multi-factor productivity involves multiple inputs, problems can arise in trying to quantify inputs.

Alternative Productivity Measures. Many white collar activities result in outputs that are difficult to define or are intangible. As a result, output/input measures can sometimes be difficult to obtain for white collar organizations, and several alternative strategies have been developed for measuring white collar productivity. Most of these alternative measures are designed to overcome cases where the output is either not well defined or easily countable.

1. Normative Productivity Measurement Methodology: Normative Productivity Measurement Methodology (NPMM) is a process whereby productivity measurements (or surrogate measures) are developed by participants from the organization through the use of structured group processes such as the Nominal Group Technique and/or the Delphi

Technique (11:10). A surrogate or proxy indicator is something used in place of a measure that is not directly measurable (17:246).

In the NPMM, work groups design measurement systems suited to their needs. This technique allows the measurement effort to be accepted by the organization so that it is not treated as a passing fad. Once the measurement system has been approved, it is integrated into the organization, and continuous monitoring and feedback are conducted based on initial productivity calculations.

2. Multi-Factor Productivity Measurement Model: The Multi-Factor Productivity Measurement Model (MFPMM) is a computerized model for measuring productivity. The MFPMM was developed by the Oklahoma State University, Oklahoma Productivity Center as part of a management decision support package, and uses organizational periodic cost and quantity data for both output and input to develop a productivity index.

3. Administrative Productivity Indicator: The Administrative Productivity Indicators (APIs) is a single overall measure quantifying how successful an organization achieves its purpose. This method is an attempt to apply production line productivity measurement techniques to white collar organizations. According to Christopher, API methods are similar to plant productivity measurement methods and can be used in cases where a single output can be defined as the measure of successful performance of the organization (3:3.3). To develop an API, Christopher says that an organization should use the following steps (3:3.3 - 3.4):

a. Define the purpose of the organization in a written statement.

b. Once the organization has identified its purpose, the next step is to identify the organization's physical output. This output must be a single,

physical, countable entity showing what the organization was organized to accomplish. Reports produced, checks processed, or documents reviewed are all examples of outputs.

c. Following identification of the output, the output should be tested. Testing the output requires determining if the output shows work accomplished, and if the work accomplished shows achievement of purpose.

d. The final step is to define the input. Materials, energy, and capital inputs are typically minor for administrative organizations; consequently, input measures are usually expressed in terms of labor hours.

The API can be calculated as work output divided by labor hours input. However, for administrative productivity measures, the traditional output/input formula can be inverted, dividing input by output and expressing the ratio as hours per unit (HPU). HPU is a more meaningful measure of white collar productivity because, typically, a white collar employee may spend part of each day working on several different tasks each with a different output. The HPU then becomes a number the organization tries to reduce, with a base HPU being established and periodic HPUs indexed against the base and compared for productivity improvements.

Because white collar outputs can be intangible, defining the output to measure can be difficult. Keith Bolte's case example of developing APIs for Intel Corporation is an example of this difficulty (3:3.17 - 3.18). In developing an API for the Intel Corporation payroll department, the obvious choice of output seemed to be the number of employees paid. However, Bolte points out that this is not a good measure because, regardless of the number of employees paid, the payroll window remained open for 16 hours. This meant there was a constant input. Looking deeper, Bolte found that before

anyone could be paid, a time card or sheet had to be audited. The number of time cards audited represented a better output measure, because with such a measure (hours per time card audited), new ways can be investigated for improving the time card auditing process. By reducing the time required to audit time cards, the payroll department could improve its productivity.

In some service organizations such as banks and airlines, capital input is a significant resource. In these instances, partial productivity measures can be calculated and monitored for each input (3:3.5). For example, labor API would be calculated and used to monitor work output per labor input, and capital API would be calculated and used to monitor work output per capital input.

4. Multiple Output Productivity Measures: In many professional, administrative, and service organizations, a single output does not adequately describe successful accomplishment of the organization's purpose. In cases where organizations have multiple outputs, a rating scale technique is used to combine the measures into a single, overall measure called a Multiple Output Productivity Indicator (MOPI). The MOPI is usually a single number representing the output of the organization. This output is used as an API, and an HPU is calculated to measure overall productivity performance of the organization.

The steps required to develop MOPIs are similar to those required for developing APIs except that the organization defines multiple outputs representing successful accomplishment of their purpose. Developing MOPIs also requires weighting each of these outputs individually, and then combining these outputs into the MOPI.

The difficulty with MOPIs is combining or aggregating the outputs into a single output. Bolte's Intel Corporation case example illustrates how this can be done (3:3.18 - 3.19). In developing an API for the Personnel Records/Benefits Department, multiple outputs had to be converted into a single "surrogate" indicator. For example, an organization may desire a measure of quality; however, since quality is not directly measurable, customer satisfaction may be used as a surrogate to tell something about quality. To overcome this challenge, Bolte combined the seven Personnel Records/Benefits functions shown below into one surrogate indicator called "Total Number of Personnel Processes Performed."

TABLE 1. PERSONNEL PROCESSES

1.	Process Personnel Action Changes
2.	Process New Hire Paperwork
3.	Process Unemployment Insurance Claims
4.	Do Employment Verifications
5.	Process Garnishments
6.	Process Personnel Reviews
7.	Process Short Term Disability Claims

The surrogate indicator was an aggregate number he derived by totaling the number of times per month each of the above functions was performed. In his case example, he used October 1982 as the base month.

During that time 2060 personnel processes were performed, and the hours worked totaled 614. This gave an API of 0.29 hours per process performed (or 17.4 minutes per process performed).

MOPIs are good indicators of the overall productivity performance of an organization with several outputs, and in addition to monitoring the MOPI, performance trends for each output can be monitored. This way, overall performance, as well as performance of each output in relation to the input, can be monitored.

Difficulties in Measuring Productivity

Measuring productivity can be a difficult task. Some of the difficulty is attributable to a lack of standard definitions and a lack of knowledge by many managers on what productivity is or how to measure it (11:8). In addition, many interpretations and perspectives on productivity exist, and to achieve some consensus about the field, there is a need for synthesis, clarification, disciplined definitions, and a generic conceptual framework (11:8). The following sections discuss some of the difficulties associated with measuring productivity.

Employee Involvement. Employees of an organization can be a source of difficulty in measuring productivity. In Japanese firms, the consequences of improved productivity are always positive. American firms, on the other hand, have tended to make the consequences of increased productivity negative for those involved (17:182). To many employees in American organizations, productivity is a job security issue with reduced head count being the consequence of improved productivity. Consequently, when

measuring productivity involves employees of the organization; managers should attempt to address the overall issue of job security.

Deciding What to Measure. Deciding what to measure is not as simple as it may seem, and is often a problem to managers. Even in manufacturing, where outputs are easily defined, counting outputs is not always simple and sometimes does not provide the required results. Many managers also tend to define productivity as output/input in their heads but, when they implement a system to measure it, end up implementing a system that measures the broader issue of performance, of which productivity is only one element (17:180). Two of the fundamental difficulties in deciding what to measure involve product mix and outcomes.

1. Product Mix: Many organizations do not produce a single, uniform product; usually many and diverse products are produced making it difficult to combine outputs into a single unit. An example would be a farmer trying to add apples and oranges as outputs. To fix the product mix problem, most organizations use a weighting method such as price or labor, and establish a base period price or labor. In the case of the farmer, apples and oranges equate to a certain price or number of labor hours. When expressed in terms of price or labor, apples and oranges can be aggregated into a single unit of output, and can therefore be expressed in terms of dollars per labor hour.

2. Output vs. Outcome: Another problem managers face is in deciding whether to measure output or outcome. Productivity is often used as a measure of performance. Traditional measuring techniques stress output (efficiency) and neglect outcome (effectiveness); however, in many cases, outcome may be more important (3:3.50). For example, the output of police activities includes arrests and traffic tickets The public, however, may be

more concerned with the crime rate, an outcome that is affected by police activities but not directly controlled by it. As noted earlier, an outcome is not an output/input ratio. It measures the output performance, and, therefore, is not a true measure of productivity. Consequently, although outcome may be what is desired, measuring it may not tell a manager much about the productivity of his organization.

Who Does the Measuring. Often what is measured is influenced by who does the measuring. Accountants may decide that financial indicators such as return on investment may be the best way to measure productivity, whereas engineers may decide that physical measures such as output per labor-hour is more appropriate (14:34, 38). In measuring productivity as an efficiency ratio, managers must be aware of how engineers and accountants treat productivity. Engineers, in dealing with engineering systems, view efficiency as always being less than 100%, whereas accountants strive for output/input ratios greater than 100% because the margin above 100% represents profit.

Interpreting Productivity Measurements. In addition to the difficulties involved in deciding what to measure, interpreting the results of the measurements is a significant source of difficulty. As pointed out previously, partial factor measures do not provide the entire productivity picture, and can be misleading to a manager because they appear to assign productivity to only one input. Total factor measures, on the other hand, relate output to all inputs but often obscure how each individual input affects output.

Some measures can also provide misleading results. Measures of profitability (revenues versus costs) may indicate money being made without

productivity necessarily being satisfactory. Conversely, productivity can be satisfactory in spite of poor profitability (14:15).

Difficulties Measuring White Collar Productivity. In the past, most of the attention in productivity has been aimed at labor productivity in blue collar occupations. As discussed earlier, the association of productivity with prosperity and profitability, and the growth in white collar occupations in relation to blue collar occupations, have made improving and measuring white collar productivity important to many organizations.

Much of the difficulty associated with measuring white collar productivity is attributed to the intangible nature of white collar outputs. William F. Christopher points out that outputs for white collar organizations are difficult to define, and that most measurable outputs are not the best measures of successful achievement of the organization's purpose (3:3.1). Techniques such as Administrative Productivity Indicators and Multiple Output Productivity Indicators, also discussed earlier in this chapter, have been developed and applied to organizations to measure white collar productivity.

Productivity Improvement in the Air Force

Key elements of productivity improvement programs include planning, measuring, monitoring and evaluating, and implementing changes (11:29 - 41, 17:161 - 164). The available literature reveals only one documented instance where a productivity improvement program satisfying these conditions pertains to Air Force organizations.

In August 1992, the Director of Defense Information, Office of the Secretary of Defense issued DoD 8020.1M (Draft), *Functional Process*

Improvement. The manual provides the DoD recommended processes and procedures for conducting functional process improvement and requires all DoD organizations to apply these procedures their processes (7:7). The focus of the program is to improve information flow, and to improve management of information resources and systems (7:12 - 16). The key aspects of this program are to:

1. Create a baseline of the process.
2. Evaluate the process for improvements.
3. Implement approved changes, creating a new baseline.
4. Perform continuous evaluation of improved baselines.

These key aspects closely match the recommended elements of productivity improvement found in the reviewed literature (11:64).

In 1986, President Reagan issued Executive Order No. 12552, calling for a 20% increase in productivity in all federal government organizations (including all defense departments) by 1992. This, coupled with the increased emphasis in Total Quality Management (TQM), strongly suggests the existence of other productivity improvement programs in the Air Force.

Information Technology and Productivity Improvement

In the past, computers and information technology were applied extensively to improve white collar productivity. Information technology tools, such as computers and telecommunications equipment, have been the focus of capital improvements in white collar industries but, despite this large capital investment in computers and information technology, white collar productivity has yet to deliver the long awaited payback (15:11 - 17).

Michael L. Dertouzos, director of the Massachusetts Institute of Technology's Laboratory for Computer Science, headed a three year investigation into the weaknesses of U.S. industries. He found that although computers represent a major part of the U.S. economy, productivity-wise, we do not know what they are doing for us, and he feels that most attempts to improve productivity with computers is performed subconsciously and intuitively (12:SR/5).

Today, many information systems experts feel that computers have not lived up to their promise of increased productivity because managers have simply applied computers to their business process without taking advantage of the technology. Instead, computer technology is usually just added to whatever is done manually, without making allowances for the capabilities the technology provides. According to David Schnitt, computer systems in the service sector simply speed up existing work steps without eliminating the causes for poor performance (16:15 - 16). For example, if unnecessary results were the outcome of the current work steps, the same results were generated, only more frequently. If unnecessary work steps were performed, they were still performed, only faster. Schnitt says that research has shown that the introduction of a new system rarely improves work, and likens the current relationship of information technology and productivity to the electrification of factories in the early part of this century (16:16).

To illustrate further, in 1919, half the factories in the U.S. were run on electricity; however, productivity had not improved since 1890. Old steam driven machinery was being replaced by new electric machines in the existing factories, but the existing vertical layout was still being used. This situation changed, however, as new businesses built new factories with new

layouts to take advantage of electricity and electric machines. The result was that productivity soon increased.

Henry Philcox, chief information officer at the Internal Revenue Service puts it clearly. "If you start with a mess and simply add technology, you end up with an automated mess" (4:41).

Summary

Productivity is an important parameter and is defined as an efficiency concept. As a performance parameter, productivity is a relative term usually expressed in a "more" or "less" comparative and competing context. In this context, productivity can be used to compare two competing processes, which is the scope of this research.

There is no single criterion or technique for measuring productivity that is applicable in all instances. Many of the techniques discussed in this chapter were developed for specific instances of measuring productivity. Specifying what to measure and how to measure productivity depends almost entirely on the intended use and application of the measure, but implementing a system to measure productivity should always be guided by the conceptual definition of productivity. For this research, productivity will be defined in terms of Administrative Productivity Indicators (APIs) and measured as Hours per Unit (HPU).

Thomas Mahoney sums it up best:

> Productivity concepts, definitions, and measures are arbitrary and vary with the situation. The specification of output and input variables and measures will reflect, always, judgments of relevance to the concerned parties. (2:37)

III. Methodology

Introduction

The purpose of this research is to determine the effects of Document Librarian on Air Force records management productivity. This chapter outlines the methods used to determine Document Librarian's impacts on the productivity of an organization's records management process. Discussed is the technique used to measure records management productivity, including Integrated Definition Language (IDEF; pronounced *eye-deaf*) modeling, a technique used to model the records management system to determine the tasks and outputs necessary for calculating productivity, and the personal interview used to determine what percentage of the Record Technician's weekly labor hours are spent performing records management tasks under the manual process. Also discussed are the methods used to collect the required data and the techniques used to calculate productivity and to analyze any productivity difference.

In the Air Force, an Office of Record is an office responsible for keeping and disposing of records it creates and receives in performing its official function (AFP 4-31:6). As discussed in Chapter I, this research considers only one Office of Record in comparing Document Librarian's records management productivity to manual records management productivity. This is because Document Librarian is currently being used by only one organization. Although this research studies only one organization, the effects of Document Librarian on records management productivity can be

applied to other Air Force organizations. The results can be generalized because AFP 4-31, *Records Maintenance and Disposition Training,* establishes guidance regarding the basic duties and responsibilities of records managers, and applies to all Air Force military and civilian personnel whose duties require them to file, maintain, or dispose of records. In addition, all Offices of Record must accomplish the responsibilities described in AFR 4-34, *Management of Records.* Therefore, regardless of its location, function, or size, each Office of Record is governed by AFP 4-31 and AFR 4-34 and performs its activities accordingly. The responsibilities outlined in these documents are satisfied by each Office of Record using procedures tailored to meet the specific needs of that organization. The specific procedures used to manage records, then, may not be the same for each organization. The responsibilities and guidance prescribed by AFR 4-1 and AFR 4-34, however, provide sufficient similarity across organizations so that the effects of Document Librarian on records management productivity can be studied even without standardized procedures.

Key Definitions

Functional Activity: A functional activity (e.g. medical logistics) is a major business element within a functional area (e.g. health) (7:58).

Functional Process: A functional process (e.g. requisitioning, distribution) is a major business element within a functional activity. A functional activity can have one or more functional processes (7:58). For this study, records management is a functional process within the functional activity of HQ AFMC/CIMR.

Tasks or Steps: Tasks and steps are the building blocks of the functional processes. For this study, steps will be subordinate to tasks.

Approach

Because the data needed to compute manual and electronic records management productivity was not available, it was necessary to devise a productivity measurement method to collect the required data for productivity comparison. The general approach to solving the problem was to obtain and compare static productivity measures of the current manual process, and the Document Librarian electronic records management process.

In Air Force organizations, the records management process is composed of many tasks, such as referencing records for information, copying records, filing and retrieving records, and purging records. Depending on the organization, some of these tasks are performed on a regular basis, and some are performed infrequently. As currently implemented, Document Librarian performs only a subset of these tasks. Consequently, to answer the research questions listed in Chapter I, the records management process was decomposed into tasks and sub tasks. The measures of productivity were determined for only those tasks and sub tasks that are currently being performed manually, but that can be implemented electronically with Document Librarian. Tasks and sub tasks not implemented electronically were assumed unchanged from a productivity standpoint when Document Librarian is implemented. The specific approach used was to:

1. Use the IDEF0 (pronounced *eye deaf zero*) modeling technique to identify records management tasks and outputs in the current manual process and in the Document Librarian process, and select identical tasks for productivity comparison.

2. Use Administrative Productivity Indicators (APIs) measured in Hours Per Unit (HPU), to determine the productivity of the tasks selected for comparison.

3. Use a personal interview to determine the percentage of the records technician's time spent on records management, and of the time spent on records management, the percentage of that time spent on the selected manual tasks.

4. Determine the average difference in productivity between the manual and Document Librarian processes.

Justification of Modeling Technique

A model is a representation of a system or process which can be used to study some aspect of the system (9:63). For this research, an IDEF0 activity model was used to represent the records management process. The model defined the records management process as a sequential flow of tasks and identified the outputs of these tasks. The outputs were required to measure the productivity of the tasks.

To define the tasks and outputs of the records management process, two methods were considered. These methods included formulating a simple listing of the tasks and outputs, or modeling the records management process. Listing the tasks and outputs involved simply writing down the tasks of the records management process, along with their associated outputs. Simply listing the tasks and output was deemed inadequate for this research because it lacked the discipline, logic, and detail needed to identify all of the required tasks and outputs. For example, a listing of tasks and outputs does not show the logical flow of activities or interrelationships

between tasks. As a result, omission of tasks can easily occur, and when it does, is difficult to detect. Modeling, on the other hand, is a structured process which requires defining not only the tasks and outputs for the process, but also the flow of activities in the process and the interrelationships of the tasks. Consequently, modeling was selected as the better of the two approaches for defining the records management process.

IDEF0 Modeling Technique and Justification. IDEF modeling is part of the DoD Functional Process Improvement Program implemented by the Office of the Secretary of Defense, Director of Defense Information, in August 1992, and described in DoD 8020.1M (Draft), *Functional Process Improvement*. The IDEF modeling methodology is an automatic software modeling tool used to define business process activities and data. As part of the DoD Functional Process Improvement Program, the IDEF modeling methodology consists of two modeling tools, IDEF0 and IDEF1X. The IDEF0 model defines the activities of the business process for process improvement. The IDEF1X model is a data model used to complement the IDEF0 model by defining entities, along with their attributes and relationships (7:70). For example, IDEF1X would define *a file folder* as having a *unique identifier,* with *zero or more official records.* In this example, *file folder* is an entity, and *unique identifier* is an attribute of *file folder*. A relationship of *file folder* to the system is that it can consist of *zero or more official records.* IDEF1X models are important complements to IDEF0 models when using IDEF modeling for process improvement.

As discussed previously, the scope of this research was to measure the differences in productivity resulting from the implementation of Document Librarian as a records management office automation tool. Measuring this

productivity change required defining only the tasks and outputs associated with the records management process, then measuring the productivity associated with these tasks. Because data modeling was not required to measure the productivity associated with the records management tasks, an IDEF1X model was not developed; only the IDEF0 activity model was required.

Figure 1 is an example of an IDEF0 activity model. The rectangle represents the activity or task being performed and is referred to as a node in IDEF0 modeling methodology. The arrows (referred to as ICOMs) are the Inputs, Controls, Outputs and Mechanisms associated with the activity or task being modeled.

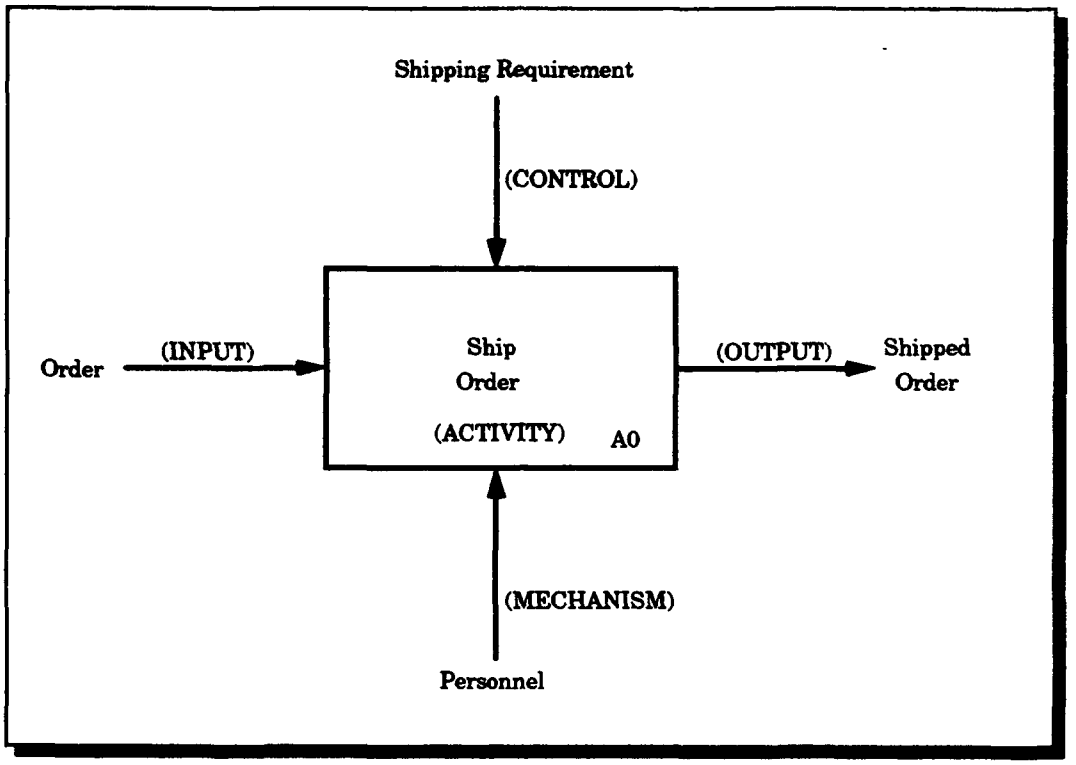

Figure 1. Sample IDEF0 Model

Below are definitions of key terminology associated with IDEF0 modeling.

1. An ACTIVITY is a named process occurring over a period of time. Activities use up assigned resources to produce products and services, and several activities can combine to make up a business process. In Figure 1 above, *ship order* is the activity.

2. An INPUT is the data or material used by an activity to produce the activity's products or services; *order* is the input to the process in Figure 1.

3. CONTROLS are the information or material that constrain an activity. Controls regulate the transformation of input to output; in Figure 1, *shipping requirement* is the control on the process.

4. An OUTPUT is the resultant data or material produced by the activity; *shipped order* is the output of the above example.

5. A MECHANISM performs or provides energy to the activity to keep it going. Mechanisms are usually people or machines. In Figure 1, *personnel* is the mechanism used by the process to transform the input to the output.

The IDEF0 modeling technique described above was used for the following reasons.

1. IDEF modeling was designed specifically to model business processes and has a large data base of successful applications (7:59).

2. IDEF modeling implements a formal, logical approach to developing business process models. This approach ensured and supported the discipline and structure required of good research.

Selected Measurement Technique

In Chapter II, productivity was defined as the ratio of the output products of a process to the resources used in producing the output. Chapter II also discussed several methods for measuring productivity, including traditional manufacturing techniques such as partial factor productivity, multi-factor productivity, and total factor productivity. Alternative techniques applied for measuring white collar productivity were also presented. These included the normative productivity measurement method and the administrative productivity indicator (API). To measure the records management productivity for this research, APIs were used.

APIs result in productivity measures expressed in hours per unit (HPU). This expression divides input labor hours by the output and is the inverse of the traditional productivity measurement expression of output

divided by input. This technique was used to define and measure productivity for this research primarily because the traditional definition of productivity (output divided by input) was inadequate in showing records management work accomplishment. In records management outputs are not produced on a continuous basis as in manufacturing. Instead, records are maintained and outputs produced on an as needed basis. For example, five records may be filed today, and zero tomorrow. Because of this inconsistency in producing records management outputs over a given period of time, using the traditional productivity measure of output per labor hour input would be meaningless in terms of records management productivity. It would also be difficult to measure because the input (labor hours) would be constant regardless of output produced.

HPU, on the other hand, shows the amount of labor hours required to produce each unit of output. This measure is easier to establish, and is more meaningful for records management because the input labor hours relate directly to each unit of output produced. Once the base HPU for the output is established, it can be used to represent productivity. A lower HPU than the base represents improved productivity. Because HPUs are a better measure of records management productivity, and since APIs make use of HPUs in measuring productivity, the API productivity measurement technique as discussed in Chapter II was used in this research for measuring both the manual and the electronic records management process productivity.

Survey Method

The answers to the research questions required determining what percentage of the records technician's time is spent performing records

management, and of the time spent performing records management, what percentage of that time is spent performing the tasks used for comparison. For example, if fifteen hours per week is spent performing records management tasks, what percent of fifteen hours is spent filing records or retrieving records? This data was required to assess Document Librarian's impact on the overall records management process productivity. For example, if Document Librarian only automates two records management tasks, filing and retrieving, but these two tasks account for 90% of the time spent performing records management, then this percentage, along with the calculated difference in productivity, can be used to estimate Document Librarian's impact on the overall process.

To collect the data on the Records Technician's records management labor hours, direct observation of the Records Technician and a personal interview were considered, with the personal interview being selected for the following reasons:

1. Size of the population of interest. Since the scope of the research was a case study and the population of interest was available locally, the personal interview was the cheapest and most efficient way of collecting the required data.

2. Time constraints. To establish a statistical database of labor hours related to the records management process, it would have been necessary to gather at least thirty data points. Doing so would allow the use of normal statistical procedures to draw conclusions about the Records Technician's work times (8:217 - 223). Using the observation method to gather this data would have required at least thirty, one-week observations of the Records Technician performing his or her normal duties. Thirty weeks of observation

would have severely jeopardized completion of the research under the given time constraints.

3. Funding constraints. In addition, because of the length of time over which direct observation of the subjects would be required, either observers would have to be hired for independent observations, or the subject under observation would be required to keep a data log. Funds for the former, if chosen, would greatly exceed the limited funds available for completion of this research.

In addition to the above reasons, the personal interview was chosen for this research because, in business research cases such as this, where the subject is uniquely qualified and has the required information, it has been established that surveys such as telephone interviews, personal interviews and mail surveys are appropriate techniques to collect the required data (9:321). Emory and Cooper cite personal interviews as an excellent data collection technique if carried off successfully. For a personal interview to be successful, they state the respondent must have the needed information, must understand his or her role, and must be motivated to cooperate (9:321). Prior to the interview, and also as part of the interview (Appendix B), the subject was screened to assess her knowledge level and understanding of her role. In addition, throughout the course of the research, a friendly, working relationship was established with the subject by making the subject part of the process, thereby motivating her to cooperate.

Data Source

Because HQ AFMC is the only organization currently managing records in accordance with AFR 4-1 and AFP 4-31, and using Document Librarian, it was used for the study.

HQ AFMC/CIMR is an Air Force organization located at Wright Patterson AFB responsible for information management research and development. In partnership with various HQ AFMC customers, it identifies customers' information management needs and develop information management systems (such as Document Librarian) that satisfy these customers' needs. HQ AFMC/CIMR consists of a total of nine people, including military officers, enlisted personnel, government civilians, and one secretary/records technician. HQ AFMC/CIMR also maintains a variety of official records, and because it is a test organization for Document Librarian, it manages records both manually and electronically.

The HQ AFMC/CIMR secretary/records technician is a GS-5 government civilian employee performing a number of office administrative functions, including records management. In the role of records technician for the organization, the secretary was interviewed to determine the percentage of work time spent on manual records management and the percent of records management work time spent performing the comparable tasks manually.

Data Collection Methods

The data required for this research were the tasks and outputs of the manual and Document Librarian records management processes, the productivity measures for comparable tasks expressed in HPUs, and the

percentage of the Records Technician's time spent managing records, plus the percentage of the records management work time spent on the selected tasks. As discussed previously, IDEF0 modeling, APIs, and a personal interview were the methods used to collect the data.

IDEF0 Modeling. IDEF0 activity modeling, as described earlier in this chapter, was used to define the records management process and to identify the tasks and outputs of the process. In IDEF0 terminology, this model is referred to as an "AS IS" model because it models the system as it currently exists. To construct the AS IS model, the following steps were used:

1. Personnel knowledgeable in the Air Force records management process were selected to serve as a functional process team. The functional process team for this research consisted of (a) Ms Wanda Dunning, HQ AFMC Records Manager, (b) Senior Master Sergeant Charles Weaver, Document Librarian Project Manager, and (c) Senior Master Sergeant Patrick Shediack, Information Resource Management Project Manager. All members of the functional process team were experienced records managers, each with at least 15 years work experience in various records management functions.

2. Using an iterative process of interviews and review meetings with the functional team, IDEF0 modeling techniques and procedures were used to build the model.

3. Following construction of the model, the functional team validated it by conducting a final review for correctness.

From the AS IS process model, tasks currently performed manually and that are implemented electronically by Document Librarian were identified for productivity comparison. Using a stopwatch, the time required

to perform these tasks were measured for both the manual (current) and electronic (Document Librarian) processes. The hours per unit of each task was calculated to estimate the difference in productivity between performing these tasks manually versus electronically.

Hours per Unit Method. Hours per unit (HPU) for the selected outputs was the parameter used to measure the productivity of the selected tasks. The productivity was measured separately for both the manual and the electronic processes. To determine the HPU of each identified records management task, a stopwatch was used to time the Records Technician performing each task manually and electronically. Thirty independent, random sample measurements of each task were taken to provide a database, the statistical mean of which was calculated and used as the HPU for that task. The HPU measures represented the average time it took the Records Technician to perform the selected tasks.

The HPU data collected was recorded and used to determine the difference in productivity between comparable tasks in each of the two processes (manually and electronically).

Survey Instrument. As discussed in the justification for personal interview, data on the time spent performing the tasks selected for comparison was required to determine the effect of the results on the overall records management process. To collect the relevant data, an interview guide was developed and the Records Technician was surveyed using a personal interview. The interview guide used for the personal interview is provided in Appendix B.

Data Analysis

The data obtained through IDEF0 modeling, HPU productivity measurements, and the survey instrument were analyzed to provide answers to the investigative questions listed in chapter 1. The following sections provide the methodology used to answer the specific investigative questions:

Research Questions 1 and 2. What are the tasks and outputs of the current manual records management process? Which tasks from the current records management process can be implemented electronically by Document Librarian?

To answer these questions, the records management process modeling methodology was used. By modeling the current manual records management process, the tasks and outputs of the manual process were provided. Once the model was completed and validated, the functional process team was used to identify which of the tasks provided by the model were implemented electronically by Document Librarian.

Research Questions 3 and 4. What is the baseline measure of productivity for the current process using the records management tasks selected in question two above? What is the equivalent measure of productivity when Document Librarian is used to automate the tasks selected in question two above?

The API productivity measurement methodology was used to provide the answers to these questions. As discussed previously, a statistical sample of thirty measures was recorded for each of the tasks. The HPU was determined by computing the average of the 30 samples and dividing by 3600. This measure represented the productivity of the measured task. It

estimates the average time, in hours, required to produce one output of the task.

Research Question 5. What are the productivity differences between comparable tasks of the two processes?

To answer this question, comparable tasks in the manual and electronic process were measured. The HPUs of the tasks were compared, with the smaller HPU representing the more productive process for that task.

The HPU for the Document Librarian task was also subtracted from the HPU for the comparable manual task and divided by the HPU for the manual task. This result, multiplied by 100, provided the percent difference in productivity between the manual and Document Librarian tasks. A positive percentage showed the percent by which Document Librarian is more productive than the manual process. A negative percentage showed the percent by which Document Librarian is less productive than the manual process. Zero indicates no difference in productivity between the two tasks.

Research Question 6. For the tasks selected, what percentage of the overall labor hours spent on records management tasks are spent performing these selected tasks?

To answer this question, an interview guide was developed and an interview was administered to the Records Technician. The interview guide (Appendix B) contained twelve questions. Questions one, two, and three were used to establish the Records Technician's position in the organization, current grade, and level of experience in records management. Question four was used to establish the Records Technician's records management training experience. Questions five and six were used to determine the time spent performing records management tasks and percentage of that time spent on

the selected tasks. Question nine was used to establish training received in Document Librarian and familiarity with other computer software programs. Questions eight, ten, eleven, and twelve were used to establish the Records Technician's training and familiarity with Document Librarian.

In addition to answering investigative question six, the survey data was collected to help explain any significant or unexpected variances in the productivity measurement data.

Assumptions and Limitations

To accomplish the research, we assumed that Document Librarian, the records management automation software package, will function as intended by the developers. This software is currently in test and is not available for widespread usage. Because test results may dictate a change in some of Document Librarian's functions, the data and results of this research are only applicable to the current test version of Document Librarian.

Another assumption made was that the Secretary/Records Technician handles all tasks associated with managing records in the organization.

In addition, the following limitations apply to this research. First, the research was limited to documents created electronically, delivered electronically, or already scanned into the system. Hard copy documents would require a different handling process (such as scanning) and, thus, are not addressed by this research.

Second, the models were built with data from HQ AFMC and per Air Force and Federal regulations. Consequently, the records management process model should be applicable to organizations maintaining records in accordance with these regulations. However, the HPUs computed for each

task will vary from organization to organization. This variation will be due to differences in steps taken to accomplish some of the lower level tasks, number of Records Technicians and their experience and training level, and location and volume of records. To account for these differences, organizations other than the one tested for this study should compare themselves to the organization used for this study to gain a better estimate of the impact of Document Librarian on their organization.

IV. Findings and Results

This chapter provides the results of the analysis performed on the data collected to determine if Document Librarian improves records management productivity. Four tasks, determined to consume a significant percentage of the time spent managing records in an office environment, were selected for productivity comparison. As discussed in Chapter III, only one organization was found that used Document Librarian for records management, and measurements of the time it took the organization's Records Technician to perform the records management tasks manually and electronically were taken and used to determine the productivity measurements required for the study.

Personal Interview Results

The AFMC/CIMR Records Technician was interviewed for this research to determine her experience and training in records management; the approximate number of hours per week spent managing and maintaining records; and the approximate allocation of these hours to the records management tasks selected for this research. The interview guide and the responses to the interview questions are provided in Appendix B.

Records Technician Experience and Training. In determining the experience and training of the Records Technician, the interview results show that the Records Technician received records management training in accordance with AFP 4-31, *Records Maintenance and Disposition Training,* and has performed records management tasks for more than four years. The results also indicate that the Records Technician has received no formal

training in Document Librarian, but has had in excess of eight hours of training in other computer applications, including word processors and spreadsheets. The Records Technician also has a personal computer at her desk dedicated to her use, and uses Document Librarian at least once per week.

Records Management Labor Hours. In determining the Records Technician's labor hours dedicated to records management, the interview results show that she spends less than 5% of the work week, or approximately 2 hours or less per week performing records management related tasks.

Of the time spent performing records management tasks, the results show the following:

1. About 50% to 75% of that time, or approximately 1 to 1.5 hours per week, is spent filing and refiling records.

2. About 25% to 50% of the time, or 30 minutes to 1 hour per week is spent retrieving records.

3. Of the time spent filing and refiling records, 25% of the time or 15 to 22 minutes per week are spent refiling records, and 45 to 68 minutes per week are spent filing records.

4. About 5% to 10% of the time or 6 to 12 minutes per week is spent performing records management tasks other than filing, retrieving or refiling records.

Currently, there are no formal training courses established for Document Librarian; consequently, the records technician has received only informal training in the use of Document Librarian. However, the results of the interview suggest that she is familiar with computers and computer

application programs. Hence, the informal training received can be considered as sufficient in providing her with the knowledge needed to use Document Librarian effectively.

The data pertaining to the number of labor hours spent managing and maintaining records will be used later in this chapter to assess the difference in productivity between managing records manually and electronically with Document Librarian.

Task Selection

The first objective of the study was to identify the tasks and outputs of the records management process and select the manual tasks implemented electronically by Document Librarian. This objective was accomplished by IDEF0 activity modeling as described in Chapter III. The complete model is provided in Appendix A.

Since Document Librarian was designed as an office automation tool to assist Air Force organizations in maintaining official records, the model represents the records management process as performed by an Air Force organization managing records in accordance with AFR 4-34 and AFP 4-31. The resulting activity model shows that nodes A1, A2 and A3 represent the three major tasks making up the Air Force records management process. These tasks are:

(1) Input Record (Node A1) - creation of an official record,

(2) Maintain Record (Node A2) - management of official records, and

(3) Dispose of Record (Node A3) - covers the actions concerning the disposal of inactive, official records.

These major tasks were decomposed to identify tasks implemented electronically by Document Librarian. The decomposition diagrams are provided in Appendix A, and Table 2 below contains a summary of the tasks implemented electronically by Document Librarian.

TABLE 2: RECORDS MANAGEMENT TASKS PERFORMED BY DOCUMENT LIBRARIAN

TASK	TASK DESCRIPTION
File Record	Act of filing information as official record. Performed according to official file plan.
Refile Record	Act of refiling official record. Performed according to official file plan.
Retrieve Record	Act of retrieving an official record from official files.
Copy Record	Creation of copy of record for use by separate entity . Record is copied by office of responsibility, with original being returned to file system and copy disbursed to requester.
Purge Record	Movement of record from active to inactive status. Records are assessed on a case by case basis to determine whether they have exceeded official life span

Of the tasks presented in Table 2, *File Record, Refile Record*, and *Retrieve Record* were selected to be measured and the results used to assess

the difference in productivity between the manual and electronic records management processes.

Copy Record and Purge Record were not selected for the following reasons:

1. Copy Record. This task was not measured because of the cost and effort associated with simulating this task. Simulating and measuring the productivity of Copy Record would involve generating a large number of paper copies of official records, which would then have to be destroyed. Since the results of the personal interview with the Records Technician showed less than 10% of records management tasks involved copying records, this task was not measured.

2. Purge Record. Similarly, Purge Record was not measured because of the difficulty associated with simulating it. The Purge Record activity is a yearly screening of all records to determine which should be retained and which should be disposed. Since an official records purge was not scheduled during the time of this study, the actual performance of this task could not be measured. The results of the personal interview also showed that this task accounts for less than 10% of the Records Technician's records management time.

Productivity Measures

The second objective of the research was to determine the measures of productivity when the tasks selected above were performed manually and electronically. As discussed in Chapter III, Administrative Productivity Indicators (APIs) measured as Hours per Unit (HPU) were used to accomplish this objective. Table 3 below shows the measurement data

collected for each of the selected tasks in both the manual and electronic cases. The data is presented in seconds, and represents the time in seconds it took the Records Technician to perform the indicated task. At least thirty samples were collected and used to calculate the HPU measurement for each task. Because Document Librarian eliminated Refile Record, no measures of this task were required.

TABLE 3. PRODUCTIVITY MEASUREMENT DATA

	File Record (sec.)		Retrieve Record (sec.)		Refile Record (sec.)	
	Manual	Electronic	Manual	Electronic	Manual	Electronic
	88	170	50	26	20	N/A
2	58	60	77	26	25	N/A
3	63	17	58	34	22	N/A
4	68	19	192	22	25	N/A
5	79	15	45	27	12	N/A
6	70	13	265	26	19	N/A
7	66	12	114	95	10	N/A
8	70	13	45	48	12	N/A
9	60	17	395	47	12	N/A
10	67	11	53	140	9	N/A
11	74	11	148	295	24	N/A
12	38	12	48	39	16	N/A
13	58	114	43	38	16	N/A
14	27	103	48	44	17	N/A
15	47	36	81	277	9	N/A
16	27	38	40	34	14	N/A
17	36	123	45	340	11	N/A
18	36	38	150	389	14	N/A
19	34	20	66	19	11	N/A
20	32	25	105	20	13	N/A
21	28	23	108	23	10	N/A
22	27	36	40	28	16	N/A
23	29	22	174	26	21	N/A
24	26	24	89	31	12	N/A
25	32	24	116	25	9	N/A
26	34	22	145	47	14	N/A
27	42	25	131	46	12	N/A
28	53	15	173	57	15	N/A
29	27	47	12	21	8	N/A
30	47	46	17	52	9	N/A
31		40				
32		36				
33		46				
34		33				
35		25				

Table 4 below shows the estimated productivity measure (HPU) for each of the selected tasks, along with a summary of the descriptive statistics used to calculate or describe the productivity measures. The results presented in this Table will be discussed in detail in the upcoming sections for each task. This section will describe statistical measures presented in Table 4.

Because each data set is a sample of an infinite population of all such measures that can be taken under similar experimental conditions, the mean value is a sample mean or point estimate of the true mean of the infinite population. In this case, the mean is an estimate of the average time it takes the Records Technician to either file, retrieve, or refile a single record. This description just presented of the mean also applies to productivity measure of the task. As discussed in Chapter II, APIs, which are used to measure productivity for this study, can be defined as input divided by output. In this case, the time required to complete the task represents the input and a single record represents the output. Thus, the mean, expressed as time per unit, measures the productivity of the associated task. Dividing the mean by 3600, converts it to the HPU productivity measures shown in Table 4 below.

The standard deviation describes the variability or spread of the data about the mean. Since only one sample data set of each task was taken, it cannot be suggested whether either a large or small variability is good or bad. However, observations of the measurement process can be used to make inferences on why the variability is large or small.

The maximum and minimum values denote the largest and smallest data point measured respectively for that data set and serve to describe its range. For example, in filing records, the data shows that the Records

Technician took as little as 26 seconds to file an official record, and as long as 88 seconds.

The count is the number of measures taken in each sample and the sum is the total of the sample's measures. These form the basis from which the mean is calculated.

Since the sample mean is an estimate of the true mean of the population, a confidence interval can be used to show the range that covers the true mean for varying degrees of confidence. For example, the data reveals there is a 95% probability that the interval from 41 to 55 seconds contains the true mean for filing records manually.

TABLE 4. HPU MEASUREMENTS FOR COMPARABLE TASKS

	File Record		Retrieve Record		Refile Record	
	Manual	Electronic	Manual	Electronic	Manual	Electronic
Mean (Sec.)	48	38	102	78	15	N/A
Productivity (HPU)	0.013	0.011	0.028	0.022	0.004	N/A
Std Deviation (Sec.)	19	36	81	103	5	N/A
Maximum (Sec.)	88	170	395	389	25	N/A
Minimum (Sec.)	26	11	12	19	8	N/A
Sum (Sec.)	1443	1331	3073	2342	437	N/A
Count	30	35	30	30	30	N/A
Confidence Level (95%)	7	12	29	37	2	N/A

File Record Results. From the results presented in Table 4 above, the baseline productivity measure for File Record was established as 0.013 HPU.

This is the productivity measure for the Records Technician under the current manual system. When this task was done electronically with Document Librarian, the result was 0.011 HPU, a decrease of 0.002 HPU. This suggests that, on the average, the Records Technician is more productive filing records electronically than manually. When expressed in terms of the sample means, it takes the Records Technician on the average 10 seconds less to file a record with Document Librarian than manually.

Table 4 also shows a wide range and standard deviation for both manual and electronic record filing. This is to be expected since in some cases, the Records Technician knew from experience where to file certain documents, thus requiring only a few seconds to file a record in these cases. In some cases, however, AF Form 80, *Office File Plan* had to be referenced to determine where to file the record. In these cases, it took longer to file the record.

In addition to referencing AF Form 80, the wide spread and variation in electronic record filing was due to the Records Technician having to browse through some of the electronic documents before filing them. Document Librarian is designed to file electronic documents without requiring that the documents be viewed in their underlying application program. However, in come cases, the document's subject name alone was not sufficient to determine in which electronic file drawer to file the document. In these cases, the Records Technician, in addition to the normal filing procedures, had to open the underlying application program, view the document, and browse through it to determine its proper location in the file system. Because the computer system and application programs were on a Local Area Network, execution times for this process were sometimes slow.

Retrieve Record Results. From the results in Table 4, the baseline productivity measure for retrieving records was estimated at 0.028 HPU. When the Records Technician accomplished this task using Document Librarian, the estimated measure for productivity was reduced to 0.022 HPU, a decrease of 0.006 HPU. This meant that, on the average, the Records Technician was more productive using Document Librarian to retrieve records. In terms of the sample mean, it took the Records Technician, on the average, 24 seconds less per record performing the task electronically with Document Librarian.

As with *File Record*, *Retrieve Record* had both a wide range and standard deviation. As was the case with *File Record*, this wide range and standard deviation are to be expected, because in both manual and electronic processes, unless the Records Technician knows where the requested record is located, a search must be done to locate the record. In the manual mode, this is done by a trial and error method. An estimate of where the record is located is made, and that folder searched. If the folder does not contain the record, then this process is repeated until the record is found. In Document Librarian, a key search word or phrase is entered into the computer, and the computer finds and displays all records containing the word or phrase. In both cases, the time to find an unknown record is much greater than the time it takes the Records Technician to locate a known record. This resulted in the range and standard deviation for both processes being wide.

Refile Record Results. From the results in Table 4 above, the baseline productivity measure for refiling a record was estimated at 0.004 HPU. However, in Document Librarian records retrieved for reference are not re-filed. In retrieving a record, Document Librarian provides the user a copy of

the original record instead of the original record itself. This is to prevent the original record from being modified or accidentally deleted. Because the original record never leaves the electronic file folder, there is no need to refile the record. The retrieved record is simply destroyed. Consequently, the productivity measure associated with electronic refile is essentially zero. This means that in refiling records, the Records Technician is 0.004 HPU more productive when performing this task electronically than manually. In terms of the sample mean, refiling records take 15 seconds on the average when accomplished manually as compared to zero electronically since Document Librarian essentially eliminates this task.

The results also show that both the range and standard deviation for manual refiling were narrow. Again, this is to be expected since documents to be re-filed have been previously file coded, unlike newly created documents. As a result, refiling documents simply involves reading the file code on the document and placing the document in the correct location in the file drawer. Because this process does not require referencing AF Form 80, refiling times are fairly short and consistent, resulting in a narrow range and standard deviation.

Figure 2 below shows the productivity data graphically for *File Record*, *Retrieve Record*, and *Refile Record*, with the shorter bar representing the more productive process.

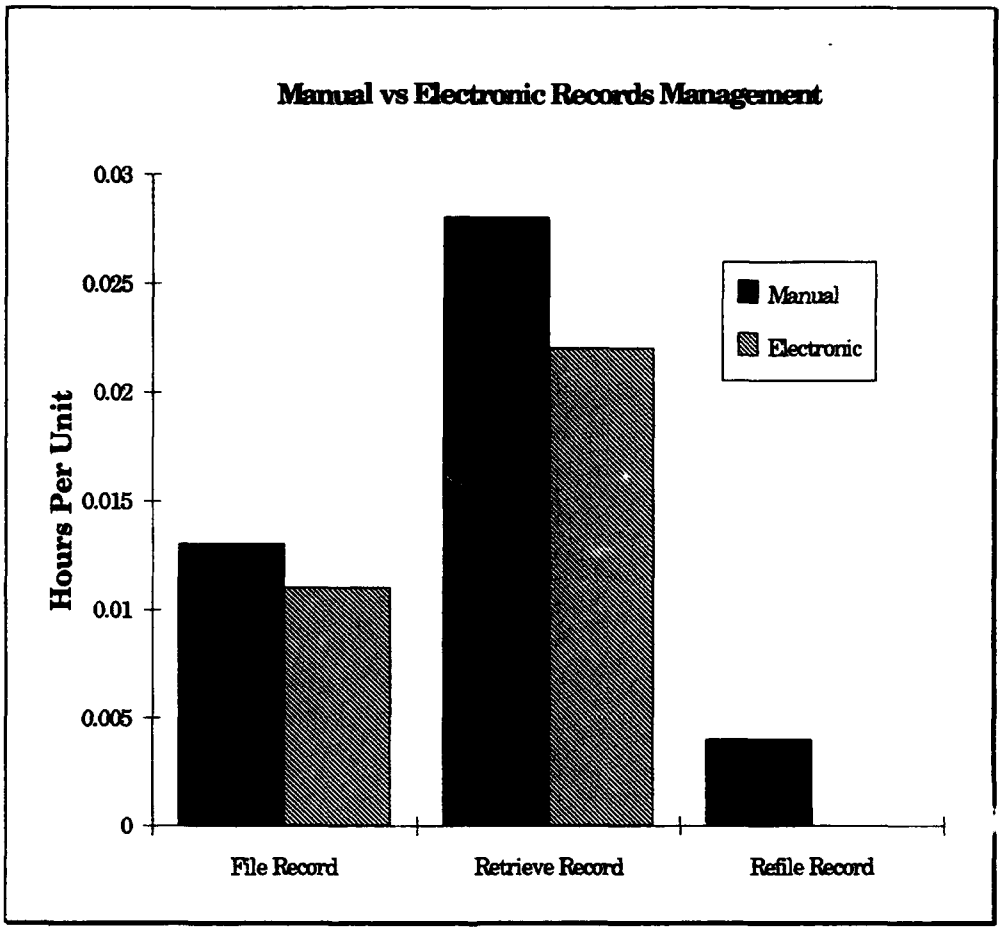

Figure 2. Productivity Differences for Selected Tasks

Percent Productivity Difference

The third objective of the research was to determine the percent difference in productivity between comparable tasks. This data is provided in Table 5 below.

TABLE 5. PERCENT DIFFERENCE BETWEEN MANUAL AND ELECTRONIC PROCESSES

	Manual (HPU)	Electronic (HPU)	% Difference
File Record	0.013	0.011	21%
Retrieve Record	0.028	0.022	24%
Refile Record	0.004	N/A	N/A

As can be seen in Table 5, the results show that for *File Record*, Document Librarian increased the Records Technician's productivity by 21%, and for *Retrieve Record*, productivity increased by 24%. Under Document Librarian, *Refile Record* was completely eliminated as a task.

Overall Manual vs Electronic Productivity Difference

The overall objective of the study was to determine the productivity difference between managing records manually and with Document Librarian. Table 6 below combines the results of the productivity measurements with the results of the survey to show the overall savings in labor hours per week resulting from automating records management with Document Librarian.

TABLE 6. RECORDS MANAGEMENT PRODUCTIVITY DIFFERENCE

	Manual Labor Hrs (Minutes)	Electronic Labor Hrs (Minutes)	Labor Hours Savings
File Record	45 - 68	36 - 54	9 - 14
Retrieve Record	30 - 60	23 - 46	7 - 14
Refile Record	15 - 22	0	15 - 22
Total	90 - 150	59 - 100	31 - 50

Table 6 shows that managing records electronically with Document Librarian can result in significant time savings. For the organization measured, the results show a saving of 31 to 50 minutes per week. This equates to a percent saving of 33 to 34 percent or 1/3 of the total weekly labor hours spent on these records management tasks. Since these tasks account for approximately 90% of the total time spent managing records, the weighted average estimate of the total weekly labor hours saved on managing records electronically with Document Librarian is approximately 30% to 31%.

Summary

Using the methodology discussed in Chapter III, this chapter provided the results of the analysis on the data collected for this study. The results showed that, although Document Librarian automates five records management tasks, only three of these tasks, *File Record, Retrieve Record,* and *Refile Record,* could be used in comparing the records management

productivity for this study. *Purge Record* and *Copy Record* were not used because it was difficult and costly to simulate these tasks, and the interview with the Records Technician showed that these tasks consumed less than 10% of the total labor hours spent per week on records management tasks.

When Document Librarian was used to manage records, the results showed that the Records Technician's productivity increased for all three of the tasks measured. For *File Record*, productivity increased 21%, for *Retrieve Record*, productivity increased 24%, and the *Refile Record* task was eliminated. In the interview, the Records Technician reported spending approximately two hours or less performing records management tasks. This time, when combined with the results of the survey, showed that she spends approximately 45 to 68 minutes per week performing *File Records* tasks manually, 30 to 60 minutes per week performing *Retrieve Record* tasks manually, and 15 to 22 minutes per week performing *Refile Records* tasks manually. This data was then combined with the percent productivity differences for the tasks selected for measurement, and weighted to account for the percentage of the records management time devoted to these tasks. Here, the results showed an overall increase in the Records Technician's productivity of 30% to 31% when records were managed electronically with Document Librarian. This percent savings equates to a time savings of approximately 31 to 50 minutes per week.

V. Conclusions and Recommendations

This chapter contains the conclusions and recommendations of this study. The objective of the research was to determine the difference in records management productivity between managing records using the current manual process and managing records using Document Librarian as an office automation tool for electronic records management. To achieve this objective, three sub-objectives were identified. The following sections explain the answers to these sub-objectives, as well as answers the main objective.

Sub-objective 1

Define the records management process, and determine which of the current manual tasks are implemented electronically with Document Librarian.

In accomplishing the study, IDEF0 activity modeling was used to define the records management process. This modeling methodology identified the major tasks and sub tasks associated with managing and maintaining records in accordance with Air Force and Federal regulations in an Air Force Office of Records. From the records management activity model, tasks currently performed manually and implemented electronically by Document Librarian were identified for use in a comparative productivity study.

The results of the study identified five records management tasks implemented electronically by Document Librarian. These tasks are *File Record, Retrieve Record, Refile Record, Copy Record* and *Purge Record*. Of the five, only three were used for the study; *File Record, Retrieve Record* and

Refile Record. Copy Record and *Purge Record* were not used because of the difficulty and cost associated with simulating these tasks. Although only three tasks were used in estimating the productivity differences between manual and electronic records management, the results of a personal interview with the HQ AFMC/CIMR Records Technician showed that these three tasks constitute 90% to 95% of the weekly labor hours spent managing and maintaining records.

Sub-objective 2

Determine a suitable technique for measuring the productivity of the selected records management tasks and use this technique to determine the productivity of these tasks when they are performed manually and electronically.

Productivity is a performance measure relating the output of a process to one or more of the resources required to produce the output. Although this definition of productivity is simple, measuring it is often not as simple. Chapter II discussed many of the difficulties associated with measuring productivity and some of the techniques used to measure it.

White collar productivity is especially difficult to measure because of the intangible nature of white collar outputs. To overcome this difficulty, several techniques were developed specifically for measuring white collar productivity. Many of these techniques were discussed in Chapter II, and of those discussed, Administrative Productivity Indicators (APIs) were determined to be appropriate for measuring the records management process productivity, and was used in this study.

APIs measure productivity as Hours per Unit (HPU), defined as the labor hours required to produce one unit of output. As was evident in the literature, no single measure of productivity is directly applicable for all cases. This held true in this study, necessitating the development of a technique to determine the HPU for the records management tasks. To determine the HPU for the selected tasks, each task was performed under simulated conditions and time measurements were taken of the Records Technician performing the task. This resulted in a baseline HPU being established for the manual process, and a comparative HPU for the electronic process.

Sub-objective 3

Determine the more productive of the two processes.

The results of the study revealed that when Document Librarian was used to manage and maintain records, the HQ AFMC/CIMR Records Technician's productivity increased by approximately 30%.

Chapter II discussed the common perception that computers and information technology, when used for office automation and process improvement, is usually good for an organization and leads to increased productivity. Chapter II also points out that many organizations, after investing capital in computers and information technology, have not received the desired productivity gains, and that many organizations are beginning to question whether applying computers and information technology to business processes necessarily results in increased productivity. Because managers are more critical of investing capital in computers and information

technology, results from studies such as this can be useful in showing how productivity will be affected.

Recommendations

Future Studies.

Because this study was performed before widespread implementation of Document Librarian, only one organization was used in determining the effects of Document Librarian on records management productivity. An area for future research would be to conduct a study such as this, but with a larger and more diverse sampling of organizations. This research would be worthwhile because it could determine statistically whether Document Librarian can improve Records Management productivity across a variety of organizations.

Another future study would be a user satisfaction survey regarding Document Librarian. Although the use of a tool or device can improve a worker's productivity, some may be reluctant to use it for a variety of reasons. A user satisfaction survey would determine whether or not organizations using Document Librarian are pleased with its performance and if not, reveal the problems.

General Recommendations.

With the push toward office automation and a paper-less office, personal computers have become important office tools. In the Federal Government, including the DoD, spending on computer and information technology has more than doubled since 1982 (13:36). This increase has made personal computers readily available to many Air Force office employees and has resulted in many office personnel performing tasks

previously relegated to clerks or secretaries. This widespread use of computers by all manner of office employees has created a multitude of opportunities to increase both the efficiency and effectiveness of the office environment . This study has shown that Document Librarian is one means to aid in that increase. The small sample on which the conclusions of this study are based, however, dictate that each organization assess Document Librarian on an individual basis to determine its usefulness to its operations.

Finally, Chapter II points out that many organizations simply apply computers to their current processes without making allowances for the improved technology. This can also be seen in the records management arena. Currently, in many organizations, records management tasks are handled by the Records Technician. By using Document Librarian, office personnel, including managers, can easily perform many of the tasks currently performed by the Records Technician. Consequently, it is recommended that organizations review their records management procedures and, before employing Document Librarian, adjust their records management procedures to best use this new technology.

Appendix A. Activity Model of the Records Management Process

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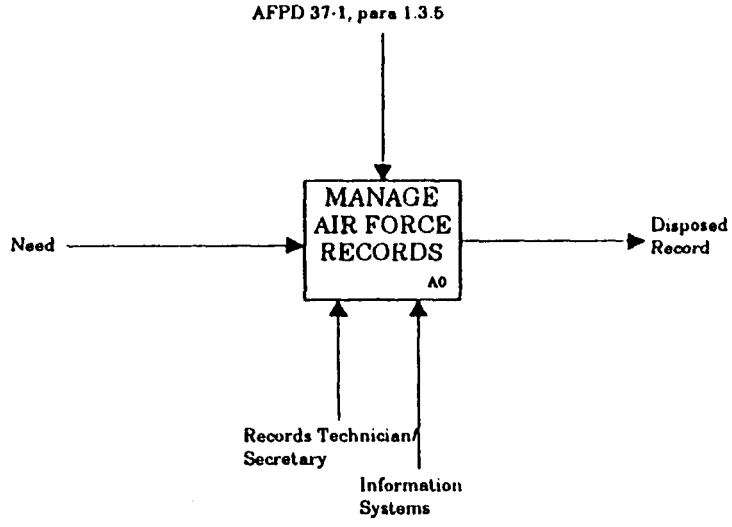
			X	PUBLICATION			



Purpose: To model Air Force Records Management Process
Viewpoint: Office of Record Information Manager

NODE: A-0	TITLE:	NUMBER:

USED AT:	AUTHOR: Capt Dave Gaines / Capt Trevor Nelson	DATE: 9 Aug 93		WORKING	READER	DATE	CONTEXT:
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	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED			
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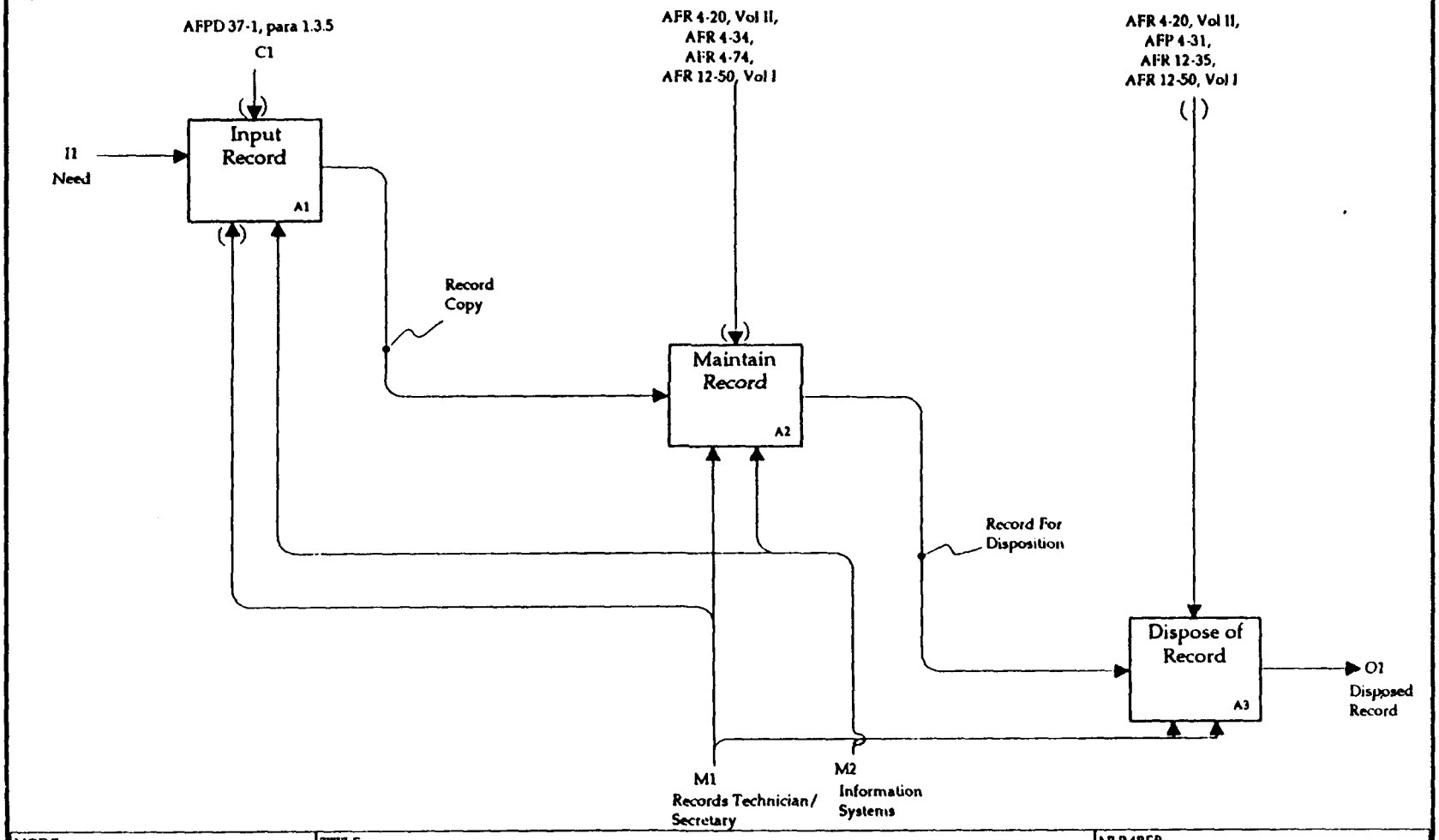

NODE: A0	TITLE: MANAGE AIR FORCE RECORDS	NUMBER:

USED AT:	AUTHOR: Capt Dave Gaines/Capt Trevor Nelson	DATE: 9 Aug 93		WORKING	READER	DATE	CONTEXT:
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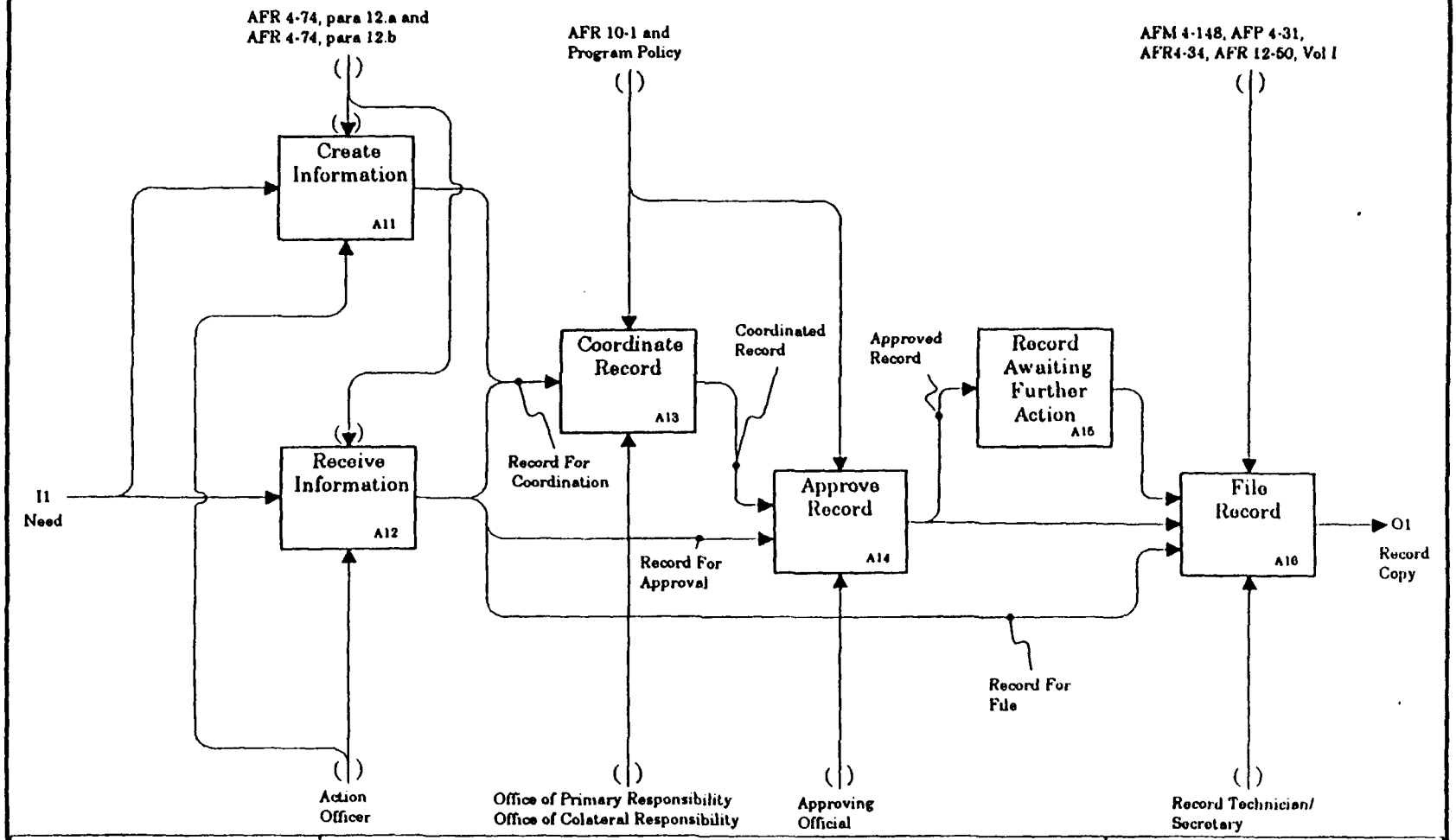

NODE: A1	TITLE: Input Record	NUMBER:

USED AT:	AUTHOR: Capt Dave Gaines/Capt Trevor Nelson	DATE: 9 Aug 93		WORKING	READER	DATE	CONTEXT:
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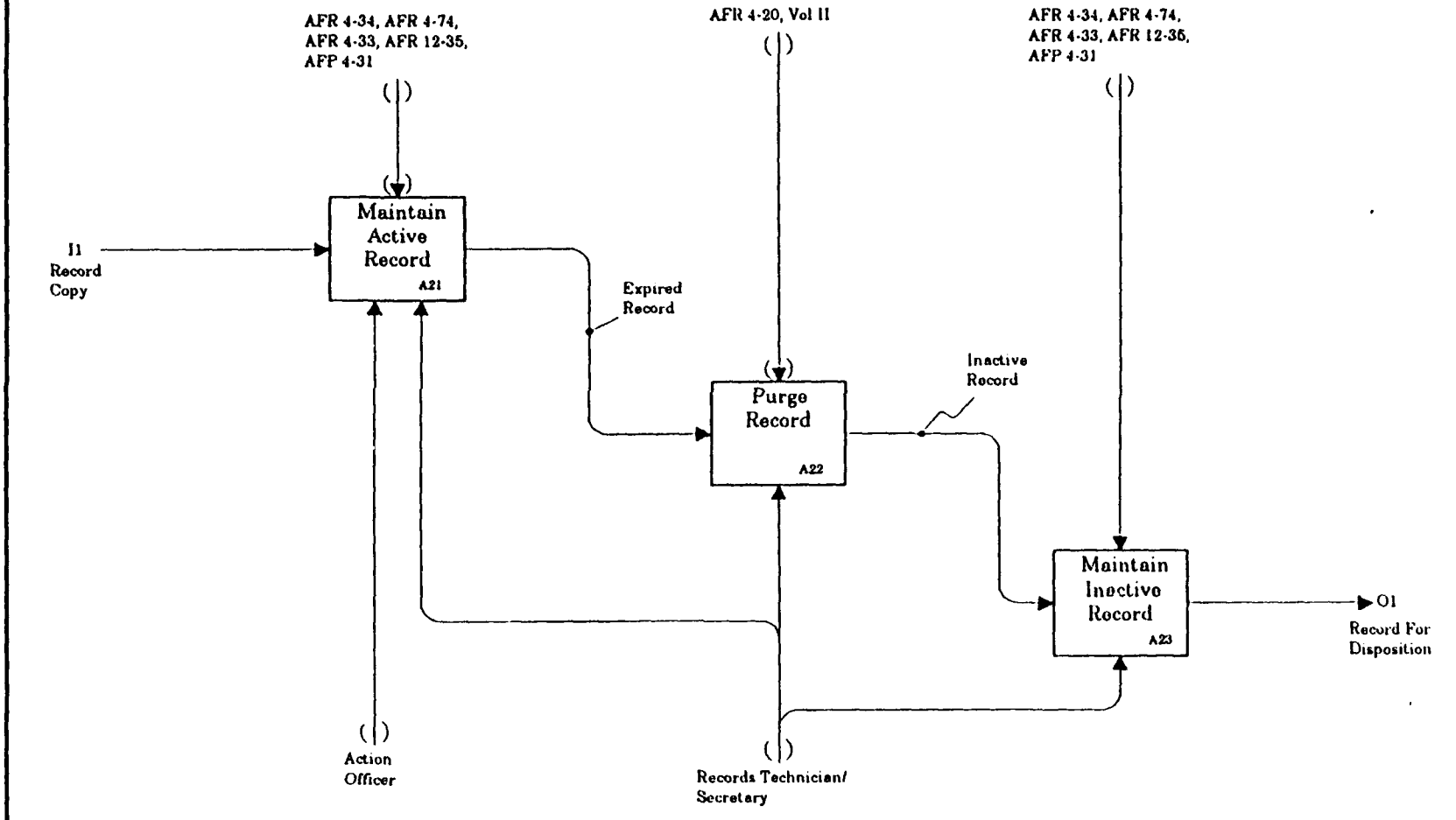
			X	PUBLICATION			



NODE: A2	TITLE: Maintain Record	NUMBER:

USED AT:	AUTHOR: Capt Dave Gaines/Capt Trevor Nelson	DATE: 9 Aug 93		WORKING	READER	DATE	CONTEXT:
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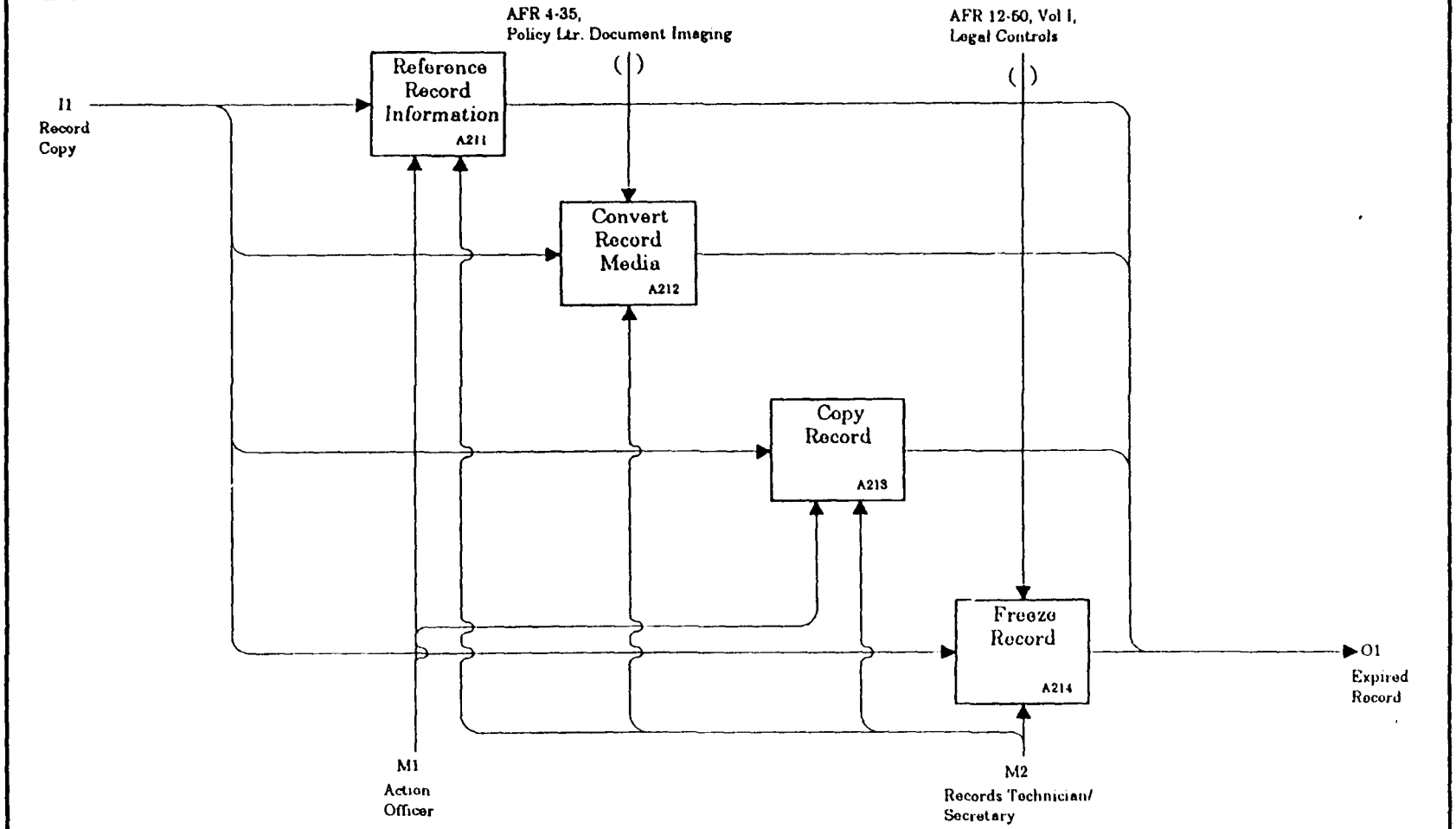

NODE: A21	TITLE: Maintain Active Record	NUMBER:

USED AT:	AUTHOR: Capt Dave Gaines/Capt Trevor Nelson	DATE: 9 Aug 93		WORKING	READER	DATE	CONTEXT:
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				RECOMMENDED			
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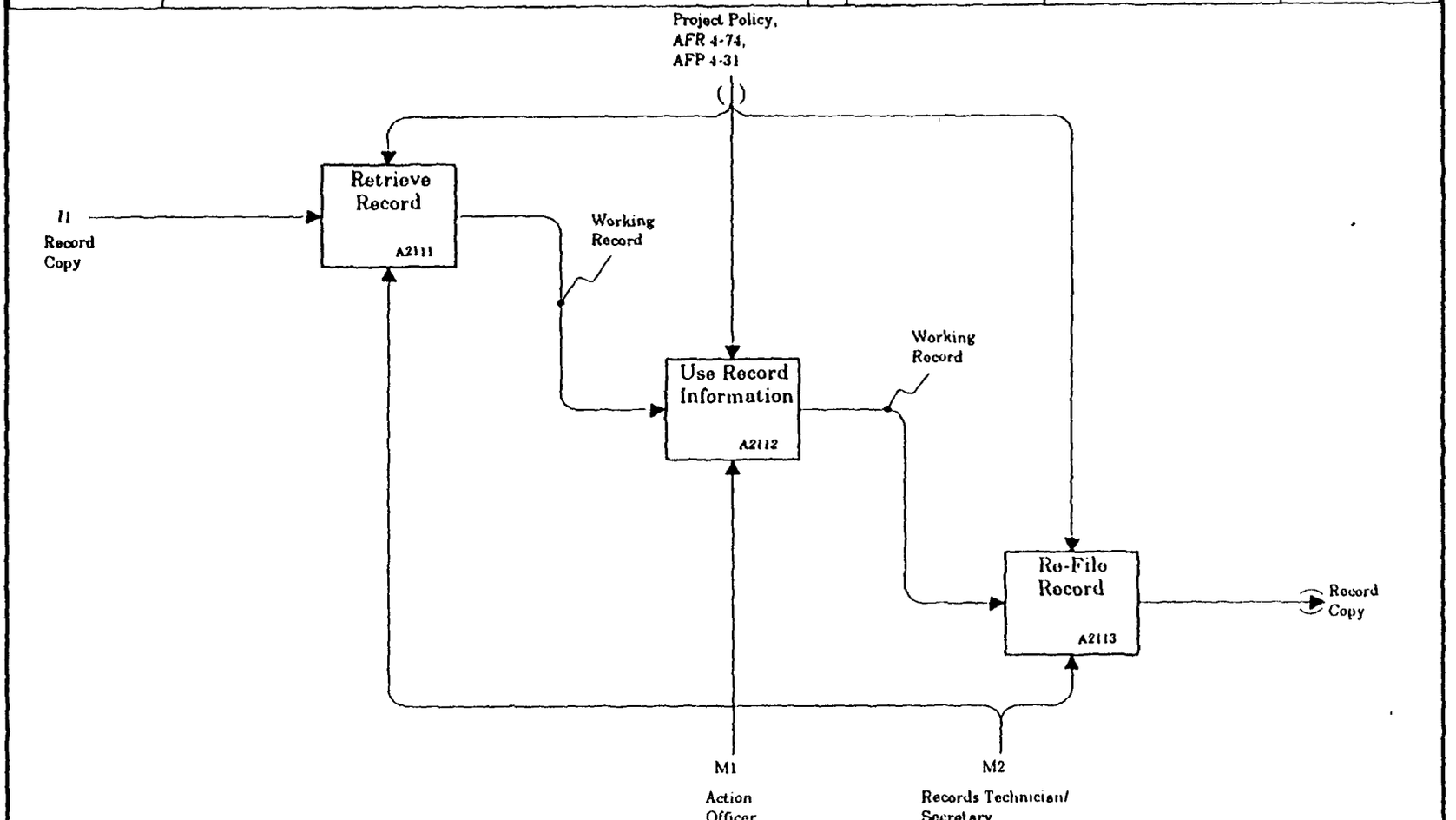

NODE: A211	TITLE: Reference Record Information	NUMBER:

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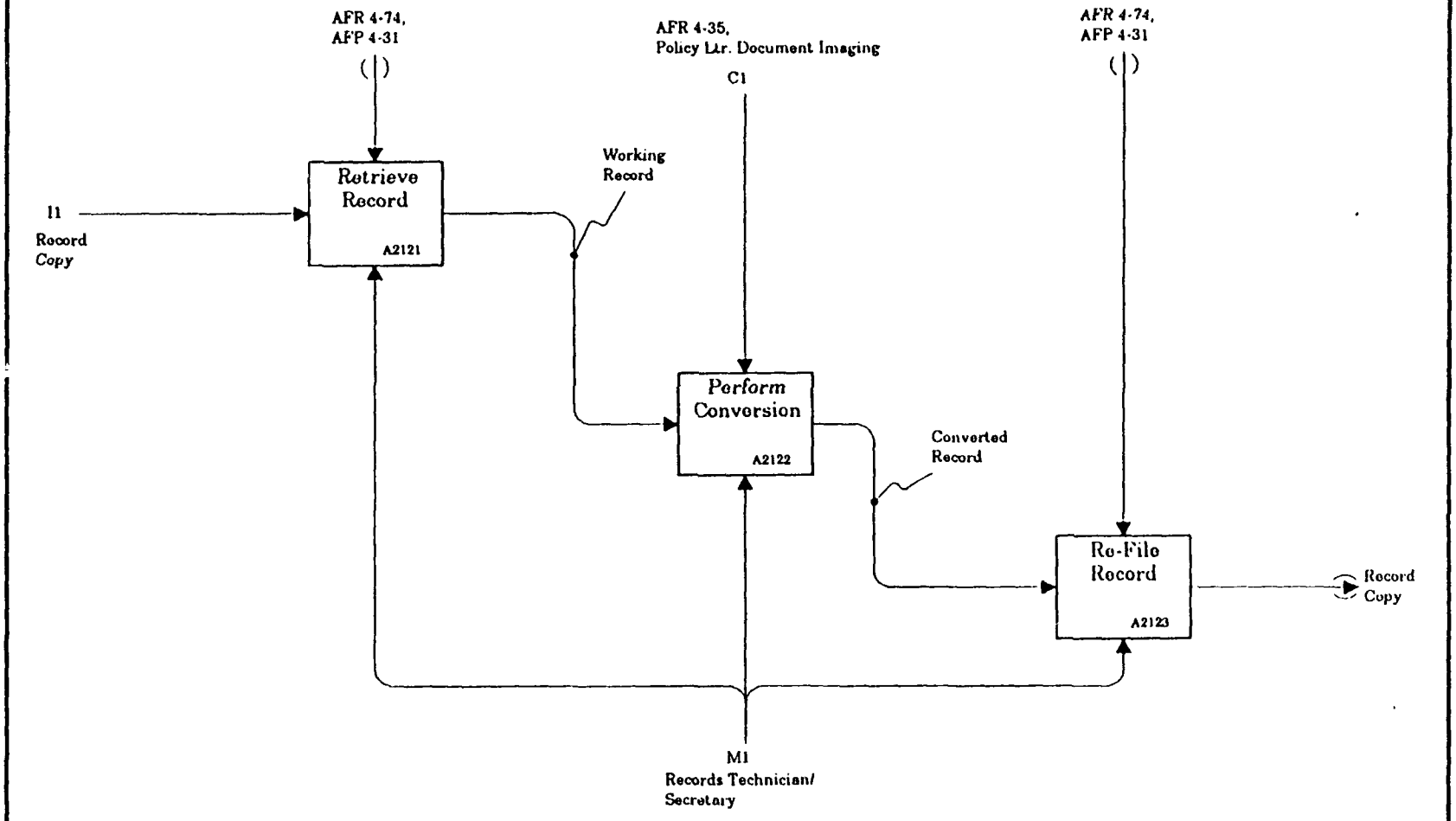

NODE: A212	TITLE: Convert Record Media	NUMBER:

USED AT:	AUTHOR: Capt Dave Gaines/Capt Trevor Nelson	DATE: 9 Aug 93		WORKING	READER	DATE	CONTEXT:
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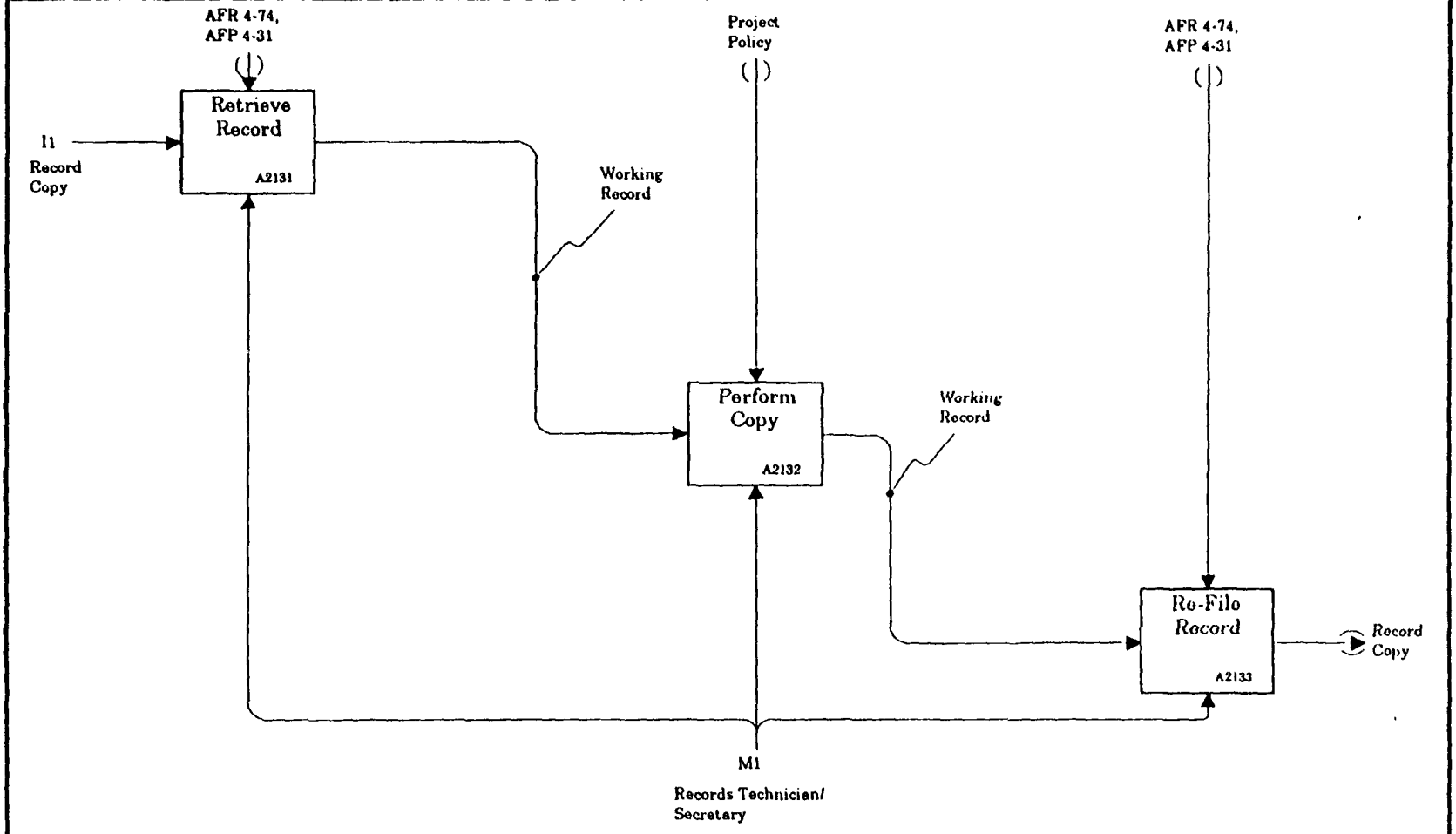

NODE: A213	TITLE: *Copy Record*	NUMBER:

USED AT:	AUTHOR: Capt Dave Gaines/Capt Trevor Nelson	DATE: 9 Aug 93		WORKING	READER	DATE	CONTEXT:
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	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED			
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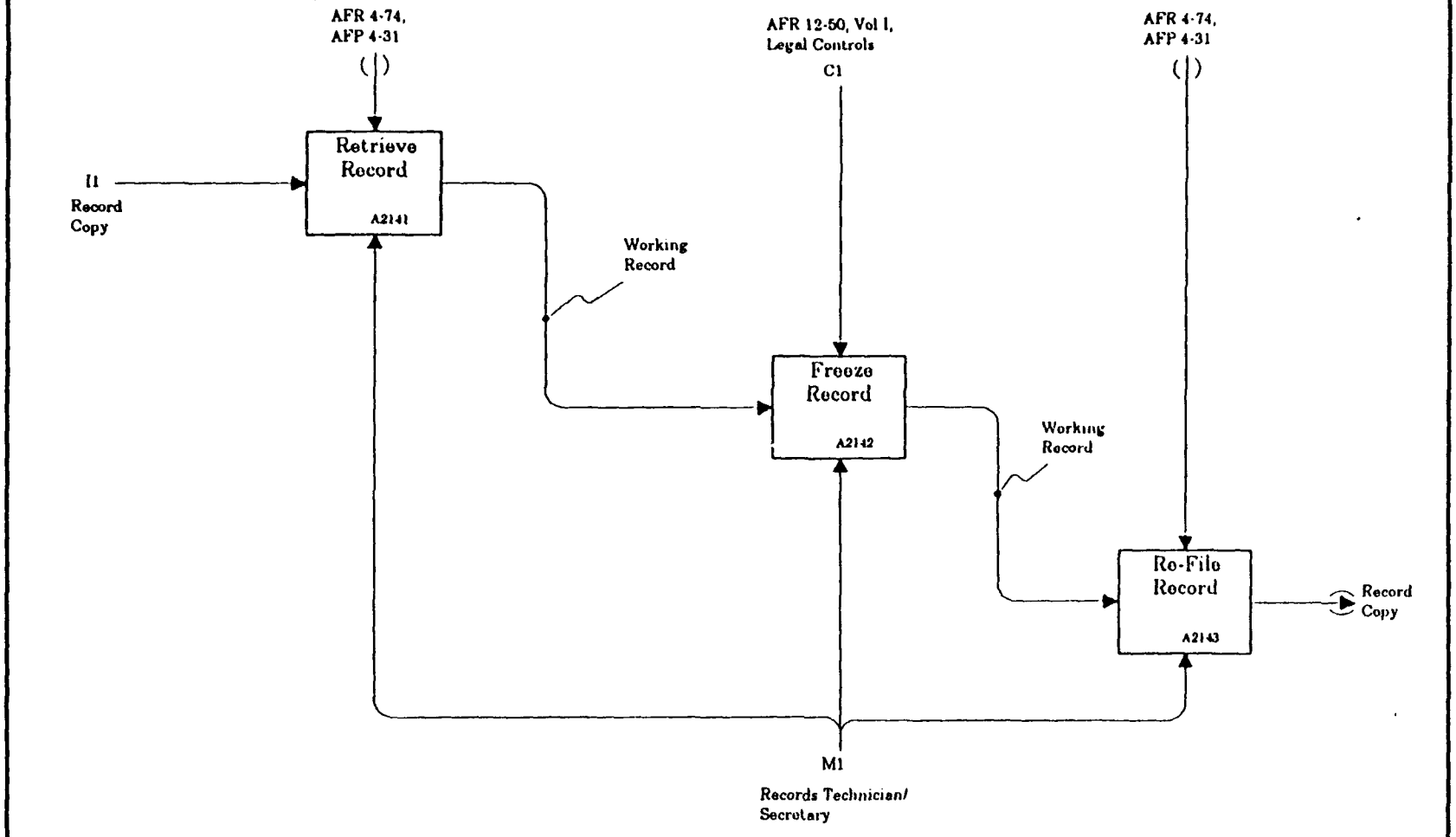

NODE: A214	TITLE: Freeze Record	NUMBER:

USED AT:	AUTHOR: Capt Dave Gaines/Capt Trevor Nelson	DATE: 9 Aug 93		WORKING	READER	DATE	CONTEXT:
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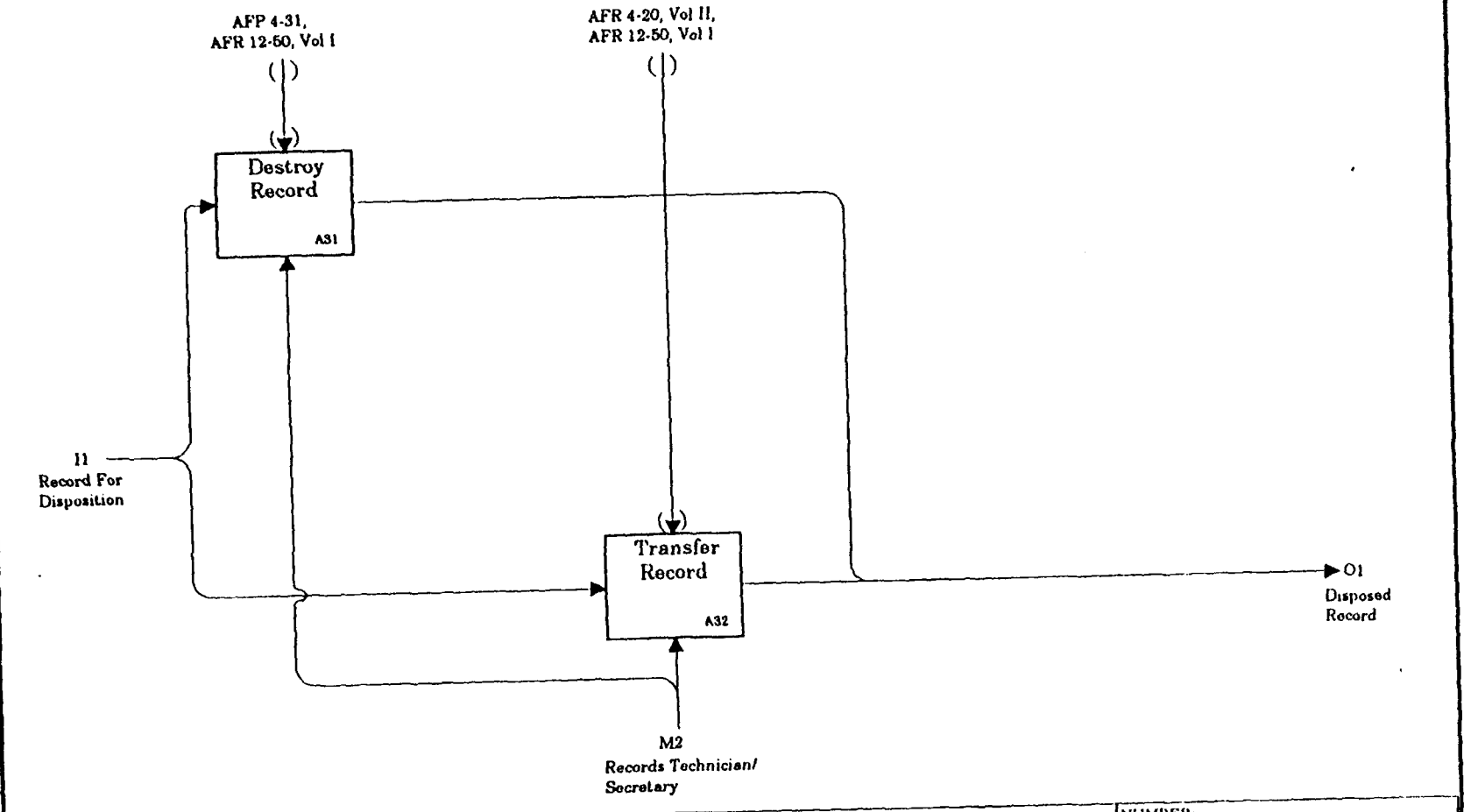
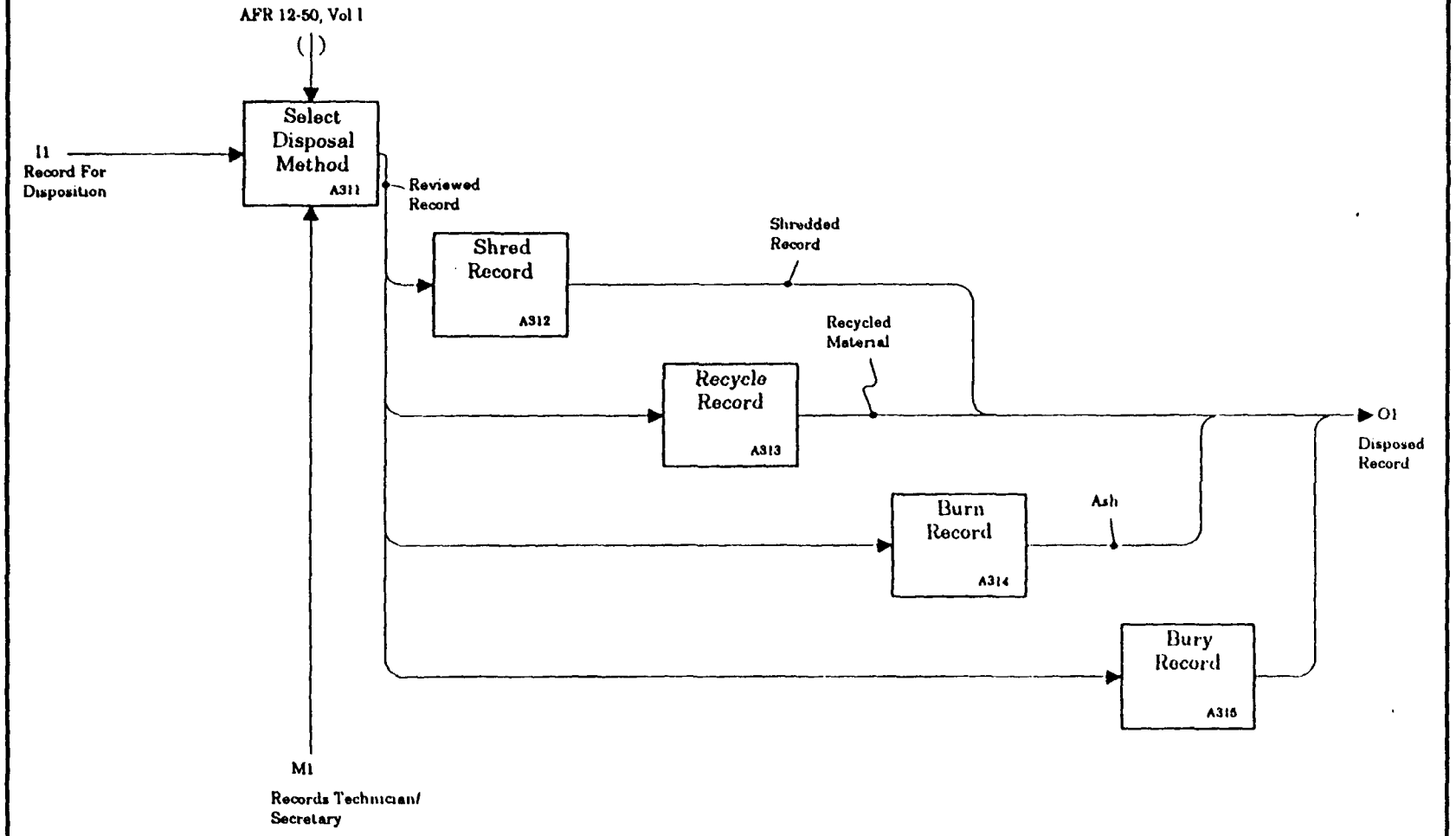


NODE: A3	TITLE: Dispose of Record	NUMBER:

USED AT:	AUTHOR: Capt Dave Gaines/Capt Trevor Nelson	DATE: 9 Aug 93		WORKING	READER	DATE	CONTEXT:
	PROJECT: Air Force Records Management	REV:		DRAFT			■
				RECOMMENDED			□
	NOTES: 1 2 3 4 5 6 7 8 9 10		X	PUBLICATION			



NODE: A31	TITLE: Destroy Record	NUMBER:

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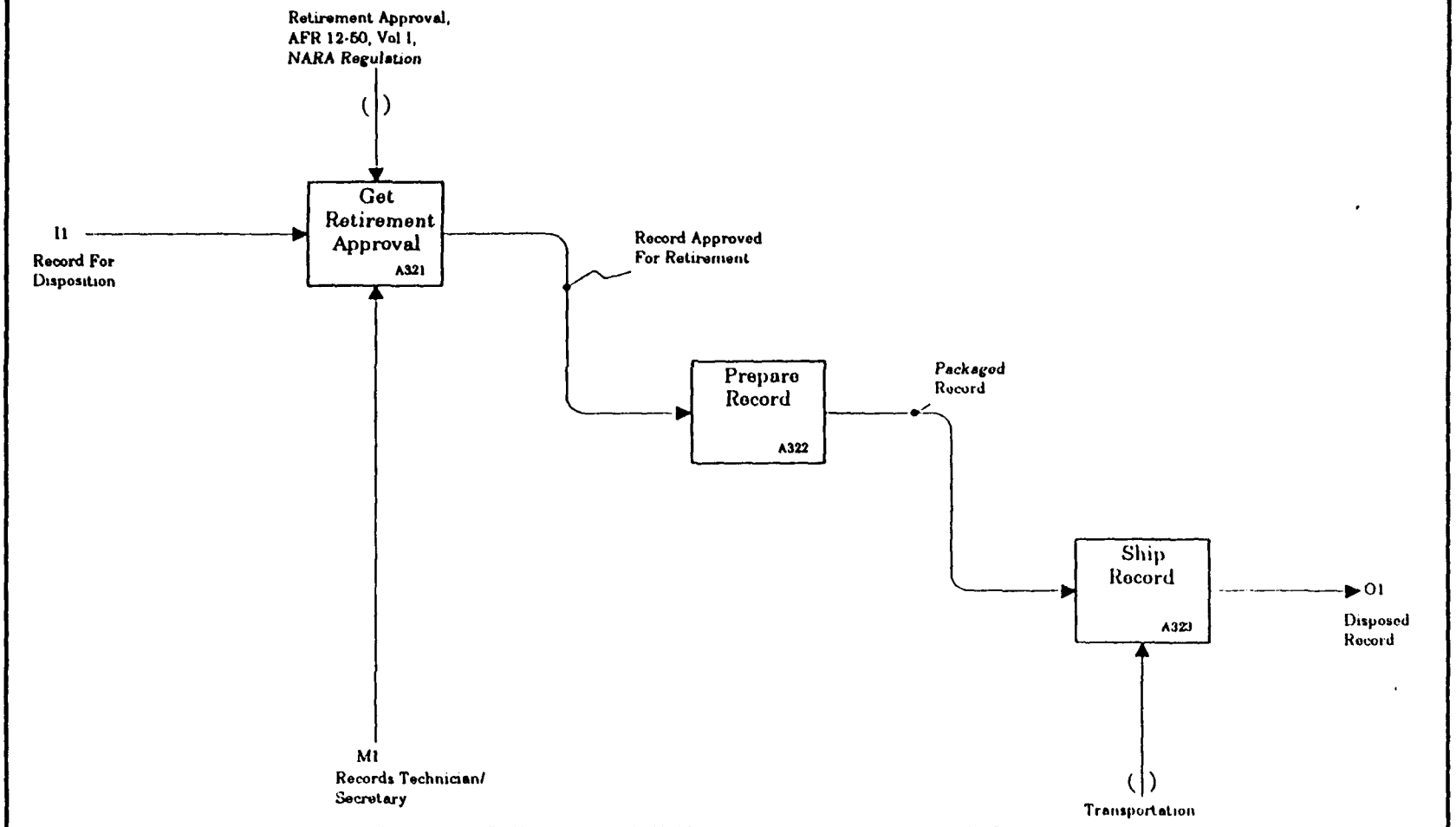
				RECOMMENDED			
	NOTES: 1 2 3 4 5 6 7 8 9 10		X	PUBLICATION			■



NODE: A32	TITLE: Transfer Record	NUMBER:

IDEF Model Data Dictionary

Terms	Definitions
Node A-0	
Need	Requirement to create an official record.
Records Technician/ Secretary	Person trained in the creation, management, and disposition of official records.
Information Systems	System existing for the express purpose of managing information. Includes computers, file management systems, and information transfer infrastructures.
Disposed Record	Record which has been disposed of and is no longer maintained.
Node A0	
Input Record	Creation of an official record. Includes receipt of information from another source as well as the creation of new information.
Record Copy	Official record maintained in file system. Record is strictly maintained according to file plan, and has defined lifespan.
Maintain Record	Management of official records. Includes procedures for filing, retrieving, and use of official records.
Record For Disposition	Official record which has expired or which is deemed no longer necessary.
Dispose of Record	Disposition of official record. Records are disposed of according to official regulations.
Node A1	
Create Information	Creation of new information which must be maintained as an official record. Includes new letters, contracts, trip reports, and the like.

Receive Information	Receipt of information from another source which must be maintained as an official record. Includes correspondence, technical information, contracts, and the like.
Action Officer	Person acting in an official capacity in the office of responsibility.
Record For Coordination	Information in record form requiring coordination.
Coordinate Record	Coordination of information in record form in order to validate or disseminate information.
Coordinated Record	Information in record form which has been fully coordinated.
Office of Primary/Collateral Responsibility	Office responsible for creation or maintenance of official record.
Record For Approval	Information in record form requiring official approval before being input to file system.
Approve Record	Approval of information by superior. Constitutes approval to maintain information as official record.
Approving Official	Superior with authority to approve information for input as official record.
Approved Record	Information in record form which has been approved by superior. Information is now eligible to be maintained as official record.
Record Awaiting Further Action	Information in record form which has been approved by superior, but which requires some further action before input as official record.
Record For File	Information in record form ready for input as official record.
File Record	Act of filing information as official record. Performed in accordance with official file plan.

Node A2

Maintain Active Record	Maintenance of active records. Records have not expired or been deemed unnecessary.
Expired Record	Record which has surpassed officially designated lifespan.
Purge Record	Movement of record from active to inactive status. Records are assessed on case by case basis to determine whether they have exceeded official lifespan.
Inactive Record	Record in inactive files. Record is still maintained according to regulations.
Record For Disposition	Record which has exceeded useful lifespan. Record must be disposed of in some way.

Node A21

Reference Record Information	Act of referring to record to gain information.
Convert Record Media	Conversion of record media from one type to another. Example is transferring paper files to floppy disks.
Copy Record	Creation of copy of record for use by separate entity. Record is copied by office of responsibility, with original being returned to file system and copy disbursed to requester.
Freeze Record	Freezing of record in response to outside request, usually related to some sort of litigation.

Node A211

Retrieve Record	Act of retrieving record from official files. Includes referencing file plan to determine location of record.
Working Record	Official record not currently in file system. Record which has been retrieved for some purpose.
Use Record Information	Use of information in record for some purpose. Includes referencing contracts, correspondence, and the like.
Re-File Record	Act of re-filing official record. Performed in accordance with official file plan

Node 212

Perform Conversion	Act of converting official record from one media to another.
Converted Record	Record which has been converted from one media to another. Replaces original record in official file system.

Node 213

Perform Copy	Act of copying official record, may be either manual or electronic.

Node 214

Freeze Record	Act of holding record for unspecified length of time. Record is removed from official file system and maintained in separate location.

Node A3

Destroy Record	Destruction of official record.
Transfer Record	Transfer of official record from office of responsibility to some other location.

Node A31

Select Disposal Method	Selection of method for destruction of official record. Selection is based on official guidelines and regulations.
Reviewed Record	Official record for which destruction method has been determined.
Shred Record	Act of destroying record by shredding.
Shredded Record	Record which has been destroyed by shredding.
Recycle Record	Act of destroying record by destroying information and reclaiming media on which it is stored. Usually pertains to electronic media or film.
Recycled Material	Material left as result of destroying record by recycling.
Burn Record	Act of destroying record by burning.
Ash	Material left after destroying record by burning.

Bury Record	Act of destroying record by burial.
<u>Node A32</u>	
Get Retirement Approval	Receipt of official approval to retire record. Granted according to regulations.
Record Approved For Retirement	Record which has been approved for retirement.
Prepare Record	Preparation of record for retirement. Includes labeling and packaging into approved containers.
Ship Record	Shipping of records designated for retirement from office of responsibility to new location.
Transportation	Means by which records designated for retirement are shipped.

Appendix B: Personal Interview Guide and Responses

Personal Interview Guide

1. What is your job title and position?
2. What is your current rank or grade level?
3. How long have you been working in records management?
    a. less than 1 year
    b. 1 to 2 years
    c. 2 to 3 years
    d. 3 to 4 years
    e. 4 or more years
4. What records management related courses have you attended?
5. What percentage of your weekly work time is spent on records management tasks?
    a. less than 5%
    b. 5 - 10 Percent
    c. 10 - 25 Percent
    d. 25 - 50 Percent
    e. 50 - 75 Percent
    f. Greater than 75%

6a. Considering only the time spent on records management, allocate time spent to filing records.

    a. less than 5%
    b. 5 - 10 Percent
    c. 10 - 25 Percent
    d. 25 - 50 Percent
    e. 50 - 75 Percent
    f. Greater than 75%

6b. Considering only the time spent on records management, allocate time spent to retrieving records.

a. less than 5%
b. 5 - 10 Percent
c. 10 - 25 Percent
d. 25 - 50 Percent
e. 50 - 75 Percent
f. Greater than 75%

6c. Considering only the time spent on records management, allocate time spent on tasks other than filing and retrieving records.

a. less than 5%
b. less than 10%
c. less than 25%

7. Describe Computer resources available to you at work.

a. I have a personal computer on my desk.
b. I share a personal computer with others in my duty area.

8. How many hours formal training in Document Librarian have you had?

a. none
b. 1 - 2 hours
c. 2 - 3 hours
d. 3 - 4 hours
e. 5 - 6 hours
f. 7 - 8 hours
g. greater than 8 hours

9. How many hours formal training have you had in other computer courses? What courses?

a. none
b. 1 - 2 hours
c. 2 - 3 hours
d. 3 - 4 hours
e. 5 - 6 hours
f. 7 - 8 hours
g. greater than 8 hours

10. How often do you use Document Librarian?

a. at least once a day.
b. at least once a week.
c. at least twice a month.
d. once a month or less frequently.

11. What benefits do you experience using Document Librarian?

12. What drawbacks have you experienced using Document Librarian?

Responses to Personal Interview Questions

1. What is your job title and position?

   Management Assistant.

2. What is your current rank or grade level?

   GS - 5.

3. How long have you been working in records management?

   e. 4 or more years

4. What records management related courses have you attended?

   AFP 4-31 Records Management Training in 1988.

5. What percentage of your weekly work time is spent on records management tasks?

   a. less than 5%

6a. Considering only the time spent on records management, allocate time spent to filing records.

   e. 50 - 75 Percent

6b. Considering only the time spent on records management, allocate time spent to retrieving records.

   d. 25 - 50 Percent

6c. Considering only the time spent on records management, allocate time spent on tasks other than filing and retrieving records.

   b. less than 10%

7. Describe Computer resources available to you at work.

   a. I have a personal computer on my desk.

8. How many hours formal training in Document Librarian have you had?

a. none

9. How many hours formal training have you had in other computer courses? What courses?

g. greater than 8 hours in various courses.

10. How often do you use Document Librarian?

b. at least once a week.

11. What benefits do you experience using Document Librarian?

Search mode. Document Librarian can conduct a word search for a document using a word in the title. Also others can retrieve documents from files when I am not present.

12. What drawbacks have you experienced using Document Librarian?

It is slow going through folders (search mode), and you cannot print (directly) from it.

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Vita

Captain David A. Gaines was born 19 June 1966 in Ft. Morgan, Colorado. In 1984 he graduated from high school in Colorado Springs, Colorado, and entered the U.S. Air Force Academy. He graduated in June 1988 and received the degree of Bachelor of Science in Engineering Sciences with a speciality in Space Structures. In August 1988, he reported to Los Angeles Air Force Base where he worked as a project engineer on the Titan IV heavy lift space booster. In June 1992 he entered the School of Systems and Logistics, Air Force Institute of Technology.

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Captain Trevor J. Nelson was born on 2 April 1957 in Georgetown Guyana. He graduated from high school in Brooklyn, New York in 1974 and enlisted in the United States Navy as an Electrician's Mate. He received an Honorable Discharge in 1979 and attended San Diego State University in San Diego, California. In September 1983, he was accepted for the United Air Force College Senior Engineering Program and received the degree of Bachelor of Science in Electrical Engineering in May 1984. In August 1984, he received a commission in the USAF through the Officer Training School in San Antonio, Texas. From 1984 to 1989 Captain Nelson served as a project officer on the Small Intercontinental Ballistic Missile development program at the Ballistic Missile Office, Norton AFB, California. As a Small ICBM Project Officer, he supported the Small ICBM Geodetic and Geophysics Support Program, and the Basing Integration Program. In 1989 Captain Nelson was transferred to the 6595 Test and Evaluation Group at Vandenberg AFB, California where he served as a Small ICBM Launch Controller managing preflight assembly and test for Small ICBM developmental missiles. In June 1992 he entered the School of Systems and Logistics, Air Force Institute of Technology.

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This research was performed to study the effects of automation on Air Force records management productivity prior to widespread implementation of Document Librarian. Document Librarian is a software tool developed for Headquarters Air Force Materiel Command (HQ AFMC) to manage records in accordance with Air Force, Federal, and National Archives and Records Administration (NARA) regulations, and is currently undergoing developmental testing. One organization was used as a case study to determine the effects of Document Librarian on the organization's records management productivity. A records management process model was constructed and used to define the relevant tasks and outputs of their records management process. Administrative Productivity Indicators (APIs), a productivity measuring technique, was then used to determine a measure of productivity for the tasks defined by the model. The results showed approximately a 30% to 31% increase in the Records Technician's productivity when records were managed with Document Librarian.

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